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Editor - - C. M. POULSEN
Assistant Editor - MAURICE A. SMITH, D.F.C. (WING CDR., R.A.F.V.R.)
Art Editor - - JOHN YOXALL

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The Outlook

That Little More

THERE is something more than feeble about at least one feature of the new fuel allowances for civil aircraft. While those for charter and club flying are very reasonable and are now equivalent to 75 and 60 hours' flying a month respectively, that for the private owner has been increased only in the same proportion, and this citizen now receives the quite munificent allowance of fuel to permit six hours' flying a month. As we remarked in a leader at the time of the original allocations, the private owner's allowance of fuel is hardly worth the trouble and organization involved in its issue.

Presumably the effect of permitting more than a proportional increase to the private aircraft owner, while the car owner is still so restricted, might be politically troublesome, and that is undoubtedly why the figure remains more or less where it was before. But when announcing the car drivers' minor increases, the Ministry of Fuel and Power explained its comparative niggardliness as being a means by which the consumption of tyre rubber could, for the time being, be kept down. Although we would not suggest that aircraft do not wear out tyres—particularly on runways—this reason can hardly be put forward with any seriousness to explain the small allowance.

Of course, no individual is likely to purchase an aircraft with the possibility of so little flying, and the majority of private owners are, in fact, obtaining very fair supplies of fuel for business purposes. The rationing authorities are, too, one gathers, extremely reasonable when dealing with aircraft fuel requests, though the department concerned is badly under-staffed. Charter operators find little difficulty in making ends meet, and complain only of the waste of time and the amount of trouble caused by the system.

All of which adds up to the obvious conclusion that the ration of aircraft fuel is somewhat pointless and is continued almost solely for political reasons. But are these reasons worth the loss of time, temper and energy concerned in the operation of the system, both by the Ministry and the aircraft owners?

Back to Skids?

EVER since the Wright brothers discarded their starting rail and fitted wheels on the skids of their biplanes, we have accepted the undercarriage as a necessary evil. The skids have disappeared but the wheels remain. In the early days we took the line of least resistance in design and construction, but the line of greatest resistance aerodynamically, by leaving the undercarriage below the aircraft in flight, thereby probably causing some 15 per cent or more of the total drag.

When speeds increased, and we changed from biplanes to monoplanes, designers were compelled to retract the undercarriage. This was not really very difficult with the thick wings and stout bodies which were normal at that time. Now, however, jets and turbines have given us the possibility of even greater speeds, and the tendency is towards very thin wings and slender fuselages, in neither of which there is much room for stowing a retracted undercarriage.

A contributor states, in an article in this issue, that as we approach sonic speeds it is no great exaggeration to say that the undercarriage may govern the design of the aircraft. He holds that this tendency must be resisted and points out that after all an aircraft is designed chiefly for air performance.

It is really rather ridiculous that a piece of equipment which is used for a few minutes only before and after a flight should have to be carted around for hours and hours, wasting some five or six per cent, or even more, of the aircraft's gross weight which might be more profitably devoted to pay load or fuel.

There were two primary factors which, until now, forced upon us the necessity for undercarriages: mobility

and airscrews. An aircraft was, in the initial stages, expected to be able to take-off from and alight in almost any field, or at least in fields which had a reasonably smooth grass surface. As wing loadings increased, and with them take-off and landing speeds, more and more elaborate ground preparations became necessary, until nowadays we have to have concrete runways stretching halfway across a county. In other words, real mobility has vanished.

While every aircraft had one or more airscrews, the lowered undercarriage was needed to give ground clearance for the airscrew, if these were not to be ruined in every landing, although many aircraft have been belly-landed with little other damage. Now that jets are coming into extensive use for military aircraft, the airscrew problem does not arise, and there remain only those of take-off and landing.

There is little doubt that some form of assisted take-off will be necessary for the very highly loaded types of the future, a fact which appears to point to the possibility of doing away with the undercarriage as we know it to-day.

Finally, there is the very thorny question of landing. It may be that some form of skid undercarriage will be evolved which will be far less difficult to stow in the aircraft than a wheel undercarriage. The Wrights landed successfully on skids—at 40 m.p.h. or less, it is true. Gliders do the same in modern times. May it not be that our sonic and supersonic aircraft of the not very distant future will mark the return swing of the pendulum by having the modern equivalents of the starting rail and the landing skids? It is an interesting speculation.

Pressurization Problems

BECAUSE so many modern aircraft types have been designed for pressure cabins there is a tendency to assume that all the problems have been solved. That, of course, is very far from being the case. Basically there is no very great difficulty about making the aircraft structure airtight, nor does the actual building-up of the required pressure by blowers present serious obstacles. As happens so often in aviation, the most difficult problems to deal with are the secondary ones.

Some time ago we described the research work done by Avros and Westlands on pressurization for the Tudor. On the opposite page this week will be found an article which recalls some of the troubles and tribulations which beset Vickers-Armstrongs and the High-Altitude Flight at Boscombe from 1940 onwards.

We have progressed a long way since those days, but it is interesting to find that already during those early stages some of the present problems came to light. They were by no means all connected with the pressure cabin itself. Surging of airscrew speeds due to thickening of the oil, and troubles with the flying controls caused by stiffening in the low temperatures, were also met.

As we have pointed out before, two aspects of pressurization need 100 per cent solution before real comfort in altitude flight can be offered to passengers: adequate and positive control of temperature and humidity. Much work has been done on both, and of the two the humidity control is possibly the more difficult.

In this connection, one opinion expressed by the author of the article is interesting. He believes that a sudden drop in temperature might cause more distress to passengers than the sudden fall of pressure. That is a point which we do not remember having seen raised before.

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A NEIGHBOUR DROPS IN: Touching down at Mitchell Field, New York, an Avro Lancaster of No. 35 Squadron, now on "Operation Goodwill," makes a fine study. The Squadron left England in two sections early in July and flew to Gander by way of the Azores. After Mitchell Field the Lancasters visited Scott Field, Lowry (Denver) and Long Beach (California), and on August 1 were due to take part in U.S.A.A.F. celebrations at Los Angeles. Before returning they will visit San Antonio, Morrison Field (Florida) and Andrews Field (Maryland).

The unusual nose shape of this Wellington V was caused by the pressure cabin, of which the author writes in this article.

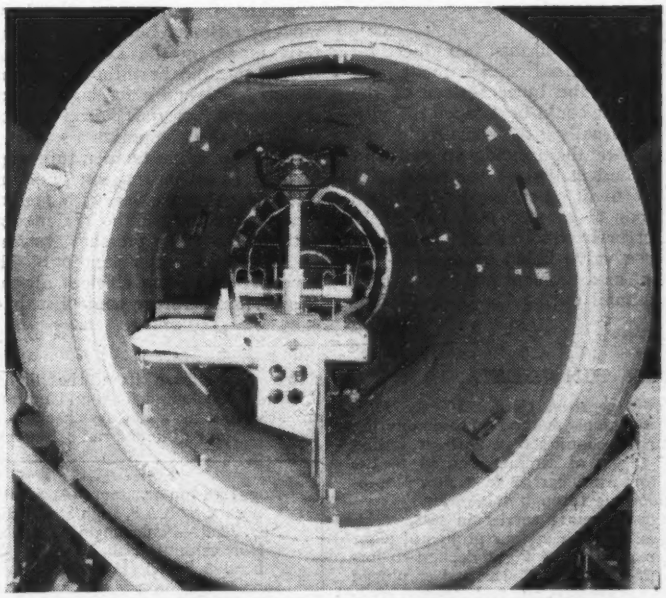
A Blown-up "Wimpey"

Some Impressions of Early Experiments on Cabin Supercharging and High-altitude Flying

By D. W. LUCKE.

IN view of the increasing use of pressurized cabins in aircraft, some of our experiences between 1941 and 1944, a few alarming and others comical, may be of general interest. On June 18th, 1942, a Vickers Wellington Mark VI (pressure cabin) climbed to 39,850 feet. The take-off weight was 24,058lb. and the crew comprised Mr. G. R. Edwards, now chief designer to Vickers-Armstrongs Ltd., Mr. R. C. Handasyde, observer, and the writer, pilot. For this flight the wing area of the machine was increased by extending the wing tips of a standard Wellington wing by 6ft each. The climb was in a straight line, starting from Brooklands and finishing in the neighbourhood of Chester.

In September, 1940, a team led by Mr. Maurice Summers, Air Comdre. David Waghorn and the late Sqn. Ldr. "Shorty" Longbottom, the two latter attached from Boscombe Down, did considerable development work with the Wellington V, which was fitted with Bristol Hercules engines and Rotol electrically operated airscrews. This machine was followed by the Wellington VI, fitted with Rolls-Royce Merlin 60 engines and Rotol hydraulic airscrews. It was a standard Wellington having a cylindrical pressure cabin extending forward from the front spar. Two Rotol blowers produced a pressure differential of 7½ lb/sq. in. (At 10,000ft, 4,000ft conditions were obtained, and at 30,000ft 10,000ft conditions.) Entrance to the cabin was effected through a circular swinging door aft, which was fitted with slots and dowels and a wheel-operated valve. The pilot's seat was covered with a double Perspex dome above cabin level The rear gunner occasionally had electrically-heated clothing to wear, and surrounded by exhaust trails, felt his solitude more keenly than ever in a temperature which once fell to −73 deg C. While Flt. Sgt. Radford never had to protect his machine from enemy air attacks, he had other unpleasant jobs to do, such as crawling forward in the non-pressurized part of the aircraft in order to see if the bomb doors were functioning correctly. This, at a height of 35-37,000ft, was no mean feat.



Inside the pressure cabin of the Wellington VI, showing pilot's control, seat and rudder bar. The rear end of the cabin (in the foreground) was closed by an airtight door. The pilot had his head in the Perspex dome and thus could not see his hands.

During 1942 a High-Altitude Flight was formed at Boscombe Down commanded by "Shorty" Longbottom. The Flight possessed a variety of aircraft, including at least one Wellington VI. Vickers-Armstrongs Ltd. worked in close collaboration with this Flight, and for long periods the writer was at Boscombe Down with a Wellington VI, and with Mr. R. C. Handasyde as observer. Occasionally we were able to borrow Flt. Sgt. Radford and a wireless operator to help us with navigation, but more often than not we flew without them.

A BLOWN-UP "WIMPEY"

As upper winds of over 100 m.p.h. were often encountered, and as our outward view was always badly restricted by internal frosting on the Perspex dome, we usually did our climbs in a northerly direction in order that we should avoid enemy-occupied France on our descent.

At first the most serious trouble encountered was violent surging of the airscrew r.p.m. due to thickening of the operating oil with low temperatures. Eventually, however, thermostatically-controlled apertures were drilled in the airscrew pistons. After much trial and error these holes produced satisfactory results. The surging at times necessitated single-engined landings. This was not too difficult in the case of the starboard engine being stopped, but as the main hydraulic pump was fitted to the port engine, vice versa was somewhat tricky. In addition, and contrary to normal Wellington practice, the emergency hydraulic pump was placed on the left of the pilot's seat, and so were the engine control quadrant and trimmers. It may be imagined how much weight was sometimes lost by a pilot during the emergency lowering of the undercarriage and flaps, when cabin temperature was in the neighbourhood of +30 deg C. No other member of the crew could help him during his violent exertions, lasting perhaps a quarter of an hour.

About this time we were also having trouble with the main aircraft control circuits, which stiffened-up progressively as the machine climbed into lower temperatures. To illustrate how very stiff the aileron controls could become, Mr. Handasyde, acting as observer and weighing about 11½ stone, on one occasion lifted himself bodily off the cabin floor by grasping with both hands the starboard side of the control spectacles. The aircraft did not bank. This story was, of course, greeted with incredulous guffaws on our return, and a test rig was set up in order to ascertain the strength which a pilot could apply to the aileron circuit. In demonstrating with too much zest the writer, while applying a load of 120lb, snapped a cartilage in his shoulder. At first neither the human nor the automatic pilot could cope with this sort of flying, but a change in control-rod guides and the application of non-freezing grease throughout the circuits greatly improved matters.

Misting Troubles

Ever-present annoyances were the oil mist introduced by the cabin blowers into the pressurized compartment, and the misting or frosting-over of the inner surface of the inner Perspex dome. The latter could be scraped off with a thumbnail at intervals, but usually instrument-flying was practised above 20,000ft where the frosting started and continued until the descent had melted off the frost. On the occasion of our highest flight, mentioned above, we encountered a barrage balloon at 22,500ft over Guildford. It had broken away in a northerly wind from the Birmingham Barrage and its release valve failed to operate. It was seen directly in front of us a moment after the writer had scraped with his thumbnail during the descent from Chester. Needless to say the pilot was momentarily convinced that he had "got 'em again!"

The oil mist within the cabin usually became worse with height until, above 30,000 feet, the crew sucked oxygen in order to avoid feeling sick. The visibility in the cabin at times was so reduced that on one occasion Mr. Handasyde, 2-3 feet away from the pilot and wearing white overalls, could not be seen clearly by the latter.

In case of bad weather on landing, the double dome was hinged on its starboard side and could be opened slightly against a check cable on the port side. This produced, in effect, a clear-view panel which, as first made, could be guaranteed to direct rain and wind straight to the pilot's unprotected eyes. One made this opening rather warily and at the low speeds required for a normal approach and landing, the theory being that should the dome be carried away, it would take the pilot's head with it. This contention was soon disproved by the tallest of our pilots—a man of at least 6ft 4in, whose head was always firmly pressed against the roof in flight. He put the machine into a shallow dive, opened the dome to see better, and promptly lost it. Unprotected by goggles, with his eyes streaming, and his bald head sticking well out in the breeze above the cabin roof, he suffered considerably. In spite of the pain, he achieved a very fine forced landing, although his eyes were painfully affected for some weeks thereafter.

Complementary Tests

While Vickers-Armstrong were carrying out these tests, Rolls-Royce were flying a complementary programme from Hucknall. It is understood that Flt. Lt. "Roscoe" Turner did most of this flying and that some valuable information was derived from it by Rolls-Royce. In the Hucknall area, while flying at about 35,000 feet, Sqn. Ldr. Cyrus Colmore of the High-Altitude Flight was killed in an accident involving all his crew, including Flt. Sgt. Radford, one of the "originals." It is believed that on this occasion an airscrew blade became detached. Apart from this one very regrettable incident, the whole programme of tests was accident-free, although, so far as the writer knows, "Roscoe" Turner was the only man ever heard to say he liked flying the machine: we certainly did not.

Although the Wellington VI was never used operationally, it did provide the answer to many of the queries of the various designers. Because of its age and war-like structure, it would not be fair to compare it with the modern airliner, but a lot was learned from it. Recent tests made by the Lockheed Aircraft Corporation have shown that no harmful effects are felt by passengers at 25,000 feet when a fuselage window is knocked out, with consequent very quick drop in cabin pressure.

In the writer's opinion a sudden very big drop of 80 deg-100 deg C in cabin temperature might be much more harmful to lightly-clad passengers. For instance, three years ago, after flying a machine with pressure cabin of similar construction to that of the Wellington VI, at 24,000 feet and without using the pressure system, the writer fainted due to heat-stroke after landing. This would point to the necessity of having efficient air-conditioning systems with reliable temperature control in passenger aircraft.

OPERATION PINWHEEL

UNDER the cover-name "Operation Pinwheel" the U.S. Navy has evolved an ingenious method of manœuvring large aircraft carriers within the confines of a harbour, utilizing the combined airscrew thrust of aircraft secured to the flight deck. It is possible to turn a carrier in a slow "spinning" motion or pull it sideways through the water.

The U.S.S. *Midway*, largest aircraft carrier in the world, employs 32 aircraft as "tugs." Each of four groups of eight machines is stationed on a corner of the flight deck, two forward and two aft. "Operation Pinwheel" was first employed at Guam in June last year by the *Essex*-class carrier U.S.S. *Randolph* when heavy harbour traffic, the proximity of dangerous shoals and a lack of powerful tugs made it impossible for the vessel to manœuvre in any other manner.

On the *Midway* the "tug" aircraft are controlled by the ship's Air Officer from the flight control station in the "island." Coloured flags and normal flight-deck hand signals are used and as a double check radio communication is employed. Four different radio frequencies are used.

FORTHCOMING EVENTS

Aug. 15th (on or after).—Attempt on World's Air Speed Record by R.A.F. High Speed Flight.

Aug. 22nd.—Model Engineer Exhibition opens at the New Horticultural Hall, Vincent Square, Westminster, London, S.W.1 (11 a.m.).

Sept. 9th.—Ministry of Civil Aviation demonstrations of technical radio equipment.

Sept. 12th–13th.—S.B.A.C. Flying Display and Exhibition, Handley Page Airfield, Radlett, Herts.

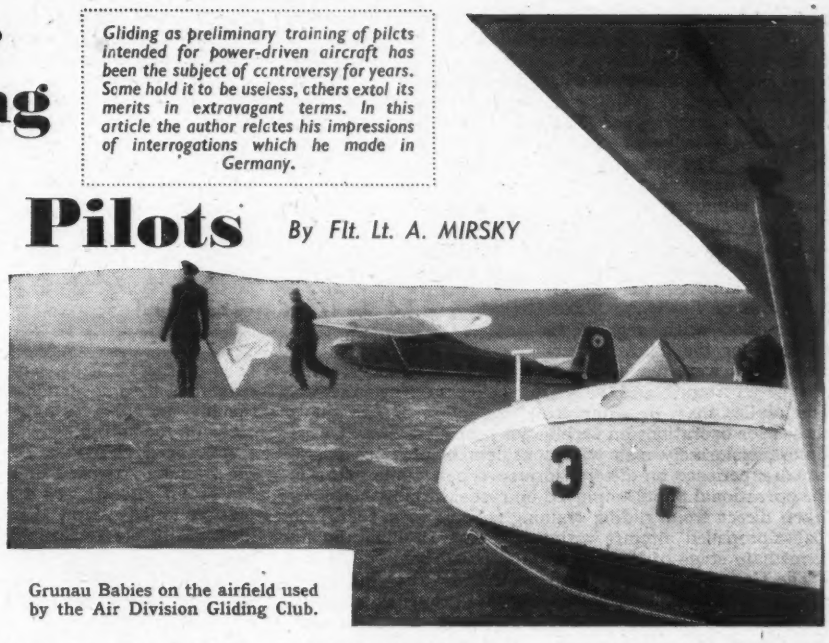
Sept. 14th.—R.A.F. "At Home" Day.

Glider Training for Fighter Pilots

Gliding as preliminary training of pilots intended for power-driven aircraft has been the subject of controversy for years. Some hold it to be useless, others extol its merits in extravagant terms. In this article the author relates his impressions of interrogations which he made in Germany.

By Flt. Lt. A. MIRSKY

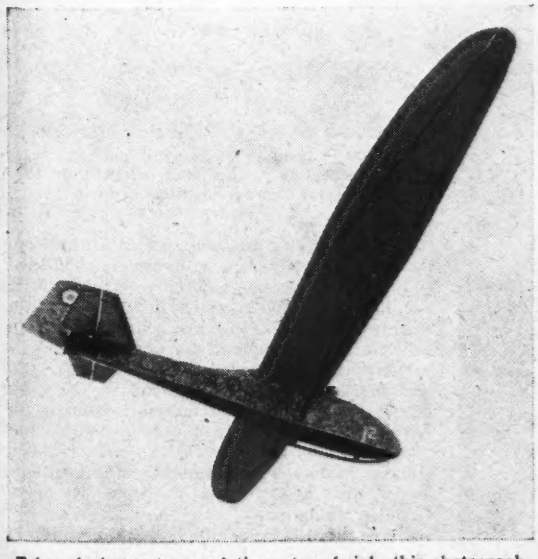
German Wartime Experiments : Initial Instruction on Towed Aircraft



Grunau Babies on the airfield used by the Air Division Gliding Club.

THE question whether gliding is a good or a bad thing in the training of pilots for powered aircraft has engaged many active minds for a long time, and it appears unlikely that the controversies between the extreme advocates of either school of thought will ever be completely settled; there are so many aspects of flying training, and often so little absolute proof that one method is better than another.

Efficiency of training is a difficult thing to measure. Even the most shrewdly elaborated tests of knowledge and ability will not ensure complete information about the examinee. In fact, the most important factors of all—the candidate's love and enthusiasm for his subject and his probable development after training—are matters which can only remain guesswork during the early stages. Thus, at the period where exact knowledge of the efficiency of training stops, not very well defined preferences and aversions commence.



Taken during tests on relative rates of sink, this photograph shows the Grunau Baby in flight.

Gliding training as a primary or auxiliary method of flying instruction appears to be sitting on the fence just now, while its forceful advocates are pushing hard to make it topple in their favour. The virtues of gliding cannot easily be summed up in a neat and convincing way, but if we leave training efficiency out of the discussion, and reflect on gliding as a sport, there can hardly be any doubt about its value and its singular aptness for the Royal Air Force. If gliding were performed only for its own sake, much could be said about its attractions and thrills. If viewed from the economy angle it would not be idle to ponder over the value of gliding to pilots of the Royal Air Force who have completed their training, and estimate what dividends the country could reap by large-scale encouragement of gliding centres at or near R.A.F. stations.

In the following notes I wish to present a brief summary of the information I gathered in the course of interrogations of German fighter and test pilots in the summer of 1945. The object of the interrogations was to form a picture of the rôle gliding played in the training of German pilots. All my talks were unofficial, and I cannot, therefore, vouch for the complete accuracy of all my reports.

The Olympia Meise is a high-performance aerobatic sailplane with most responsive controls.

GLIDER TRAINING FOR FIGHTER PILOTS

It had been brought to my notice that certain categories of German fighter pilots received their pre-operational flying training exclusively on glider aircraft and converted to jet and rocket aircraft without going through the conventional stage of training on airscrew-driven machines. I thereupon interrogated a number of German pilots who claimed knowledge of the training methods under consideration. The accounts given by these Germans varied slightly in detail, but on the whole I formed the impression that the summary of the answers I received to previously prepared questions may be taken as fairly representing the framework of the training methods adopted for certain categories of *Luftwaffe* pilots.

Enquiries with regard to training for the following aircraft types were made: Arado 234, Me 262, and He 162 turbine-jet aircraft, and the Me 163 rocket-propelled aircraft. The replies may be summarized as follows: The pilots chosen for operations on turbine-jet-propelled aircraft were almost exclusively men with considerable previous operational experience on airscrew-driven types, while many of the operational pilots employed on rocket aircraft had been taken direct from gliding training schools to a course on rocket-propelled aircraft without passing through the intermediate stage of training on airscrew-driven types.

The Germans I interrogated emphasized that the flying characteristics of turbine and rocket-propelled aircraft, especially the latter, resembled those of a glider much more than those of an airscrew-driven type because of the small engine torque reaction of the turbine and the complete absence of torque effect on the rocket type.

In broad outline, the flying-training syllabus for Me 163 pilots was as follows:

Gliding School.—(a) Pendelbock exercises. These are a form of synthetic training for which a primary S.G.38 trainer is freely suspended in a specially constructed framework, and headed into wind in order to learn the use of the controls. (b) Course up to A and B gliding certificate standard on the S.G.38. (c) Conversion course to Grunau Baby 11 and C certificate standard.

Course in Towed Flight.—Such aircraft as the Kranich and Sperber, dual-control, high-performance sailplanes, and the Habicht fully aerobatic glider, were used.

About 15 to 20 take-offs were made in tow, the most popular towing aircraft being the Me 110. At this stage of the training, special stress was laid on low flying to accustom the trainees to higher speeds. The average height to which they were finally towed was between 2,000ft and 3,000ft in order to practise circuits and approaches as executed with rocket-propelled types. Short landing lanes were marked-out with flags on the airfield to encourage accuracy of judgment on the approach and landing.

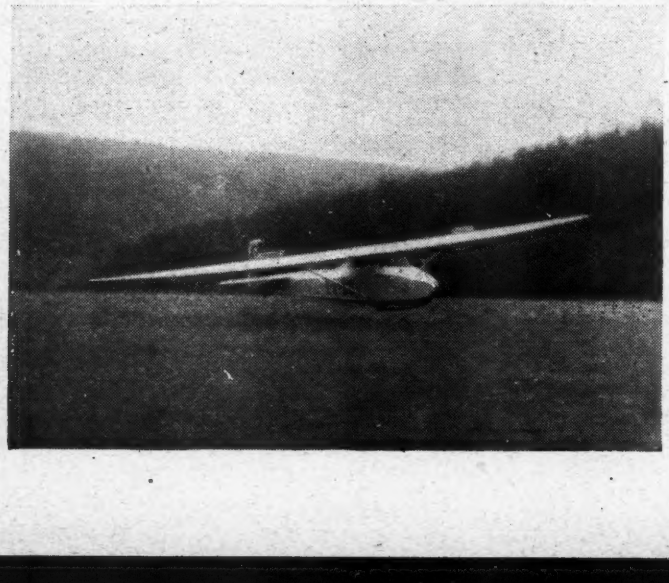
Aerobatic Course.—Satisfactory trainees were next given an intensive course in aerobatics, using in the main the Habicht glider. The Habicht is a particularly sturdy and responsive aircraft, ideally suited to violent manœuvres. However, it was found that the discrepancy in speed between the glider and the powered aircraft was too great for the average pupil during his conversion training to the rocket Mes. To overcome this, the Habicht was modified, and several versions were introduced with clipped wings. The amount by which the wing span was shortened decided the increase in wind loading and thereby the minimum speed. Thus two or three versions of the Habicht, with varying degrees of wing span reduction, became standard training types, the version with the highest wing loading having a cruising speed of the order of 100 m.p.h.

Advanced Course in Towed Flight.—The next stage of the training consisted of more towed flight, but this time the towed aircraft was a rocket aircraft without any propulsion unit. Again the tug aircraft most favoured, or most easily made available, was the Me 110. The towed aircraft was released at about 1,500ft above the airfield, and between ten and fifteen such flights were considered sufficient for an average pupil to become accustomed to the handling qualities of a rocket aircraft

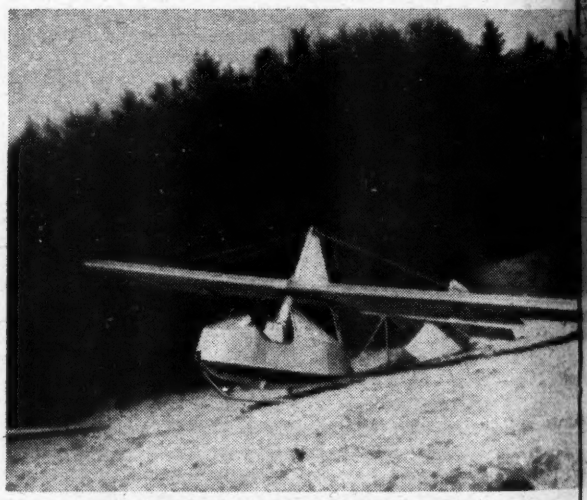
Primary Course on Rocket Aircraft.—After some theoretical instruction on the use of power, the first exercises were started with the use of a small propulsive charge which was, however, insufficient to allow the machine to become airborne. The pupil, during several such ground runs, was merely acquainted with the sensation of sharp acceleration experienced on powered take offs.

Advanced Course on Rocket Aircraft.—For the next exercises, full sets of rockets were fitted which enabled the pupil to remain airborne for three to five minutes. With about 30 such flights to his credit the pilot was considered to have completed his flying training course and to be ready to begin his operational training.

Generally, the value of glider training, especially after attaining C certificate standard, was considered by those interrogated to be very

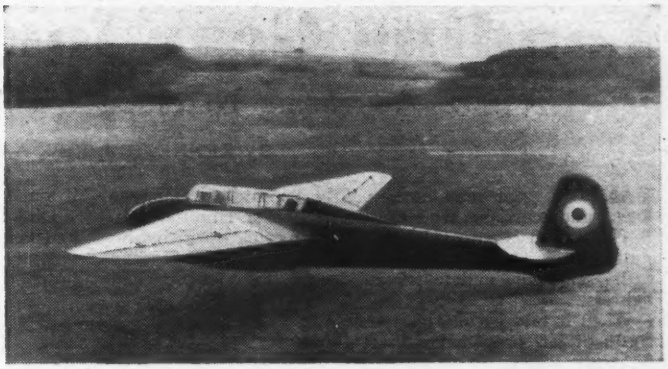


A Grunau Baby landing at the A.D. Gliding Club at Barntrup. The airbrakes at the "half out" position permit a smoother touch-down.



The S.G.38 primary glider with nacelle fitted. This elementary trainer was favoured by the S. Flieger Korps for instruction up to "B" Certificate standard.

high, but the view prevailed that the German authorities had not been sufficiently consistent in pursuing the glider-training policy. The N.S.F.K. (the Flieger Korps, an affiliated organization of the Nazi party) failed, on the whole, to satisfy the demands of the *Luftwaffe* gliding schools. Also, in the opinion of several of my informants, the wartime economy restrictions in the use of winches, transport and fuel had been a great handicap to success. They appeared to share the view that some of the virtues of glider training had been recognized too late, and that the development of advanced glider types with high wing loadings had been too limited to have made the desired impact on training reform.



The dual Kranich was one of the most popular German sailplanes. Although its performance is not quite so good as that of the most efficient gliders its admirable handling qualities render it most suitable for training and competition.

The S.G.38 at the launching point. The winch cable is attached immediately before the launch.

One of the Germans spoke of a type of Link trainer under development, which combined the ordinary use of the Link with a cinematographic screen in front of the pilot, giving him an artificial cockpit view and thereby a keen sensation of speed. He said that a device of this kind was considered a valuable aid in bridging the difficulties a pupil experienced on converting from a slow aircraft to a fast one, whether it was from a light airscrew-driven aircraft or a glider.

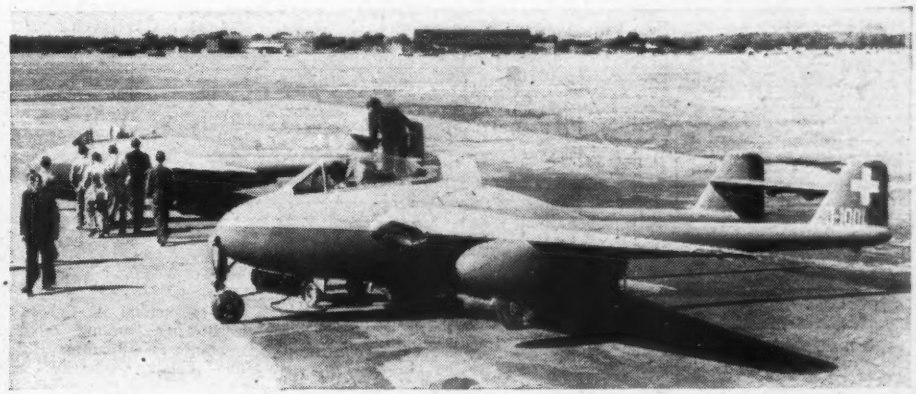
Other points which the Germans frequently stressed as arguments in favour of gliding training were:—

(a) Low accident rate.
(b) Cheapness of training.
(c) Cheapness and simplicity of maintenance.
(d) Small staff required to run the gliding schools.
(e) The psychological advantage derived from teaching the pupil pilot to handle the controls instinctively without asking him to be prepared for a possible engine failure in his initial stages.
(f) A better understanding of the atmosphere, and hence improved airmanship, and a keener sense of judgment of heights and distances.
(g) The large number of take-offs and landings which could be made in proportion to his flying time during training.

I have no doubt that the picture conveyed to me by the Germans was one in which a little too much stress was laid on the exclusive advantages of *ab initio* glider training for military pilots. Many of the claims they made needed qualifications which they did not offer. To mention only one, the question of total expenditure of training is one on which I was unable to obtain representative information, and, to be fair, I must admit that it might not have been difficult for an opponent of *ab initio* glider training to have raised a number of sceptical questions to some of the German claims.

However, as I have tried to point out above, many of the issues which various flying-training methods embody are extremely difficult to assess and compare accurately, so that there will always be room for arguments and preferences for either party. An airscrew-only advocate may, with some justification, ask somewhat reproachfully: "In what way were the German glider-trained combat pilots superior to our own?" The answer, of course, is that, on the whole, they were not superior. On the other hand, those of us who have had something to do with gliding are quite convinced that gliding and soaring is an excellent means of making a good pilot better still.

That conviction, coupled with all the enthusiasm, and the serious interest in flight, and the study of weather, which soaring instils into nearly everyone who has tasted it, should constitute a lasting safeguard for the gliding movement in this country, both civilian and the Services.



ALPINE VAMPIRES: The two D.H. Vampires lately delivered to the Swiss Government. It will be seen that long-range tanks are installed; these enabled Mr. Geoffrey de Havilland to reach Switzerland non-stop in bad weather. Two days later Mr. John Cunningham, in the second aircraft, made Geneva from Hatfield in 71 minutes, at an average speed of over 400 m.p.h.

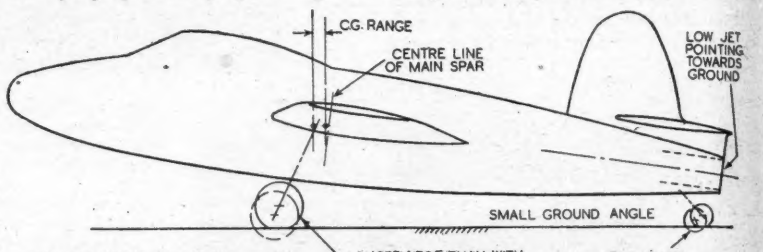
Landing Gear for Jet Fighters

Some Notes on Design Trends

By KENNETH J. KEY, A.F.R.Ae.S.

LANDING gear may conveniently be said to comprise undercarriage, with tail or nose wheel, landing flaps, brake system, and hydraulics or other operative installations. The present discussion is mainly concerned with selective undercarriage design for jet-propelled fighters.

When it first became permissible to speak of jet- propelled aircraft above an awed whisper a common remark was to the effect that we should save great lengths of undercarriage leg through having no airscrews. That there is some saving in this respect is apparent, but other influences of jet-propulsion on fighter undercarriage design have largely, if not entirely, nullified the weight reduction. The shorter legs, of course, are easier to stow and the designer is thankful for that.

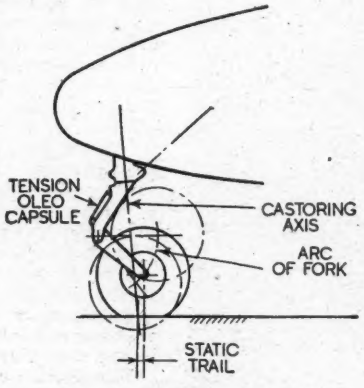

C.G. RANGE
CENTRE LINE OF MAIN SPAR
LOW JET POINTING TOWARDS GROUND
SMALL GROUND ANGLE
LONGER LEGS THAN WITH TRICYCLE MAKING TRACK STILL WIDER. TAIL-UP DIRECTIONAL INSTABILITY
TAIL WHEEL CANNOT BE RETRACTED

Hypothetical jet fighter with tail wheel, showing disadvantages of this arrangement.

The problem confronting the undercarriage designer in this class of aircraft may be briefly stated thus: to provide rolling equipment that will retract rapidly and completely, absorb impact energy at adequate vertical velocity without excessive reactions, transmit large brake torque, and be directionally stable and controllable at all speeds on the ground. The relatively long take-off run of jet aircraft emphasizes the importance of rapid retraction, so that the machine suffers the least possible delay from unnecessary drag in gaining height. The idea of complete retraction is in line with the need for a high Mach number, not merely for fighter operations but to obtain the highest output from modern jet units. Every part of the airframe envelope must form, harmoniously with the rest, as perfect a streamline shape as possible if local shock-stalling is to be avoided. Sealing, too, is important.

Energy absorption calls for no special comment here, except that a tricycle is practically essential, and that brings its own problems such as pitching effects on the nosewheel. Braking, too, is a serious problem. The smooth, low-drag aircraft settles on to its nosewheel at or near the angle of minimum drag. If the brakes fail nothing will stop the machine, unless the pilot can retract his undercarriage and scrape along on the belly. But according to present British requirements it must be impossible to retract except when airborne.

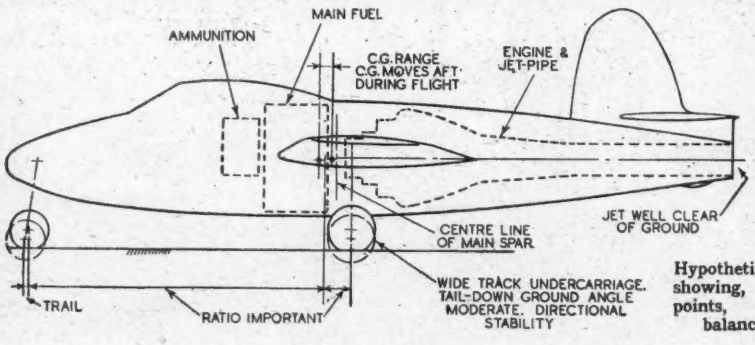
Directional stability and controllability during take-off and taxying need careful consideration. With high wing-loading and no slipstream over the tail organs the jet-propelled fighter lacks good aerodynamic control on the ground at all but high speeds. The use of a tail-wheel undercarriage, then, might be dangerous. It is well known that, with the main wheels in front of the centre of gravity, when the aircraft is rolling tail-off it is directionally unstable.



A levered-suspension nose wheel assembly, showing big variations in trail.

In the case of the tricycle arrangement, on the other hand, when the nose-wheel is off the ground the aircraft is directionally stable because the main wheels are trailing behind the C.G. When all three wheels are on the ground either type of undercarriage will have neutral directional stability, modified by inertia effects and probably the distribution of lift forces. The fact that a tail-wheel on a jet-fighter would tend to hug the ground might be a saving grace, especially if steering from the rudder-bar were fitted. Generally speaking, ground steering is done by differential braking. But if a single-jet layout is considered, accommodation for a tail-wheel is no easy matter. Imagine a well streamlined fuselage with jet unit amidships; the large jet-pipe leaves no room for a retracted tail-wheel in the normal position. This means going forward to a point where it is just possible for the upper half of the wheel to be snug and warm against the jet-pipe lagging while the other half freezes outside.

Take the tail-wheel further forward still and the aircraft may become unmanageable on the ground. Besides, in a forward position the increase in ground reaction may result in a bigger wheel being needed, thus making the problem worse. A wheel turning on to its side during retraction is just a possibility. But in any case, the ground angle is likely to be inadequate without longer main legs than would be required for a tricycle.



Hypothetical jet fighter, showing, among other points, difficulties of balance and trim.

Another consideration is the danger of damage to aerodrome surfaces through the downward-pointing jet of

LANDING GEAR FOR JET FIGHTERS

a tail-wheel machine acting like a blowlamp. That this is no imaginary snag is proved by evidence of early German jets of this type, which blasted the concrete surface into flying chunks to the detriment of nearby aircraft.

The German Me 163 rocket intercepter offered a compromise solution, with its small tail-wheel housed in a hinged fin below the jet-pipe and its flat ground angle. Incidentally, it may be recalled that this machine shed its main wheels after take-off and landed on a belly skid—an operation, one supposes, to have called for more than average skill. This type of undercarriage shows no sign of becoming popular. When the Me 163, developed by Junkers, reappeared as the 263 a retracting tricycle had been substituted.

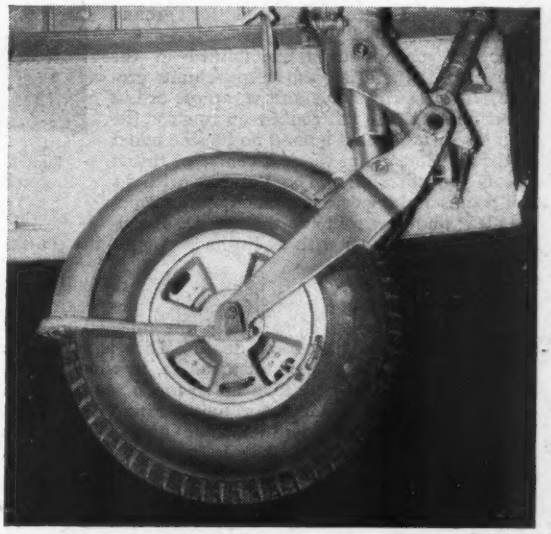
Having more or less written-off the tail-wheel, it remains to be stated that the nose-wheel is only the lesser of two evils. The jet-fighter designer's ideal of a straight-through duct from nose to engine, with pilot on top and retractable nose-wheel underneath, is not easily realized. A wheel that lies flat when retracted can be provided, but it may cost something in fuselage shape; and a divided duct passing each side of the nose-wheel interferes with armament, among other objections. The answer then may be side ducts further aft, as in the Lockheed Shooting Star.

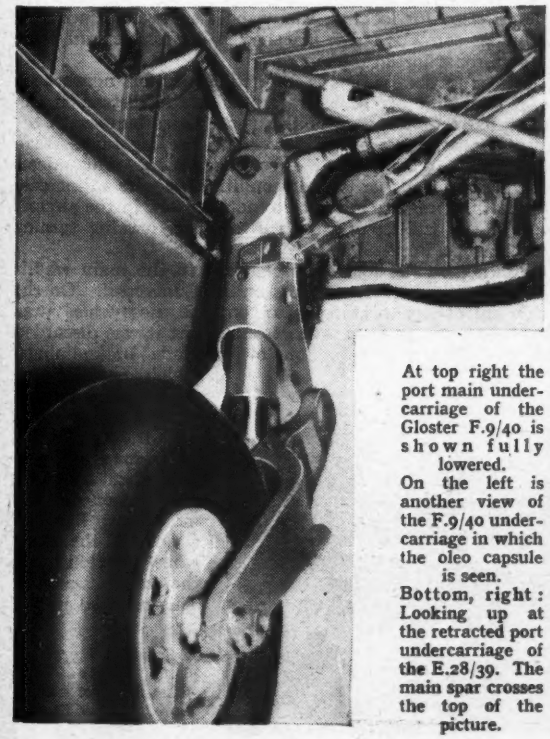
Balancing

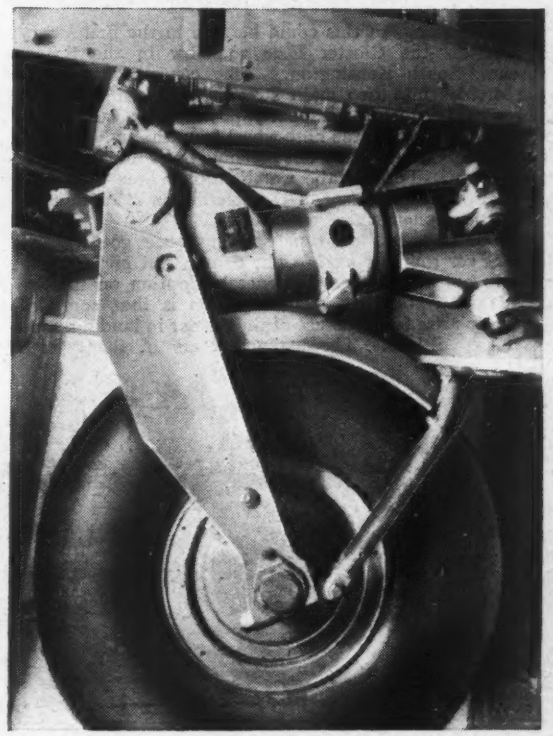
The question of balancing the aircraft enters into these considerations. The difficulty generally has been to get enough weight forward. In the single-engined machine the weight of the jet unit is far aft, which cannot be helped; in the twin, such as the Meteor, the jets cannot easily be placed ahead of the wings—though this may come. As a result, a long nose with a wheel at the end (and ballast weights probably) affords a convenient way of balancing.

In the single-engined machine, again, since the track is likely to be wide, to preserve a well-proportioned triangle the wheel base will tend to be long. This results in an uncomfortably light nose-wheel reaction, causing porpoising tendencies. Now owing to the necessarily forward location of fuel and ammunition the C.G. will move aft during flight, making the conditions worse for landing and turning on one wheel. To move the main wheels aft is no remedy, since it would delay the take-off.

From the foregoing it is evident that the proportioning of the whole tricycle layout for this type becomes a matter of great care and delicacy. The fighter with outboard twin units shows to advantage here, for the consumable weights of fuel and ammunition can be arranged in the fuselage to give a better C.G. movement; as a result the positioning of nose and main wheels is less tricky.







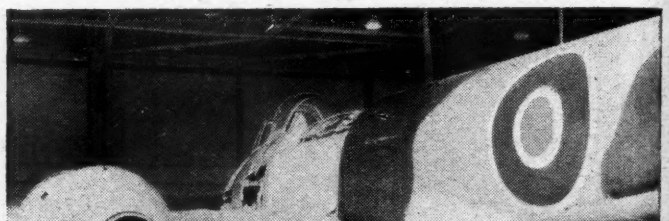
At top right the port main undercarriage of the Gloster F.9/40 is shown fully lowered. On the left is another view of the F.9/40 undercarriage in which the oleo capsule is seen. Bottom, right: Looking up at the retracted port undercarriage of the E.28/39. The main spar crosses the top of the picture.

D

LANDING GEAR FOR JET FIGHTERS

Axial-flow units, as favoured by the Germans until their career was cut short, lend themselves well to balancing requirements because they can be underslung in a fore-and-aft position to suit. But the inherent danger of a low thrust line, giving rise to a nose-diving couple when the engines are throttled or cut, will tend to worsen as bigger and more powerful units are developed. The Me 262 and the Gloster F.9/40M, one of the Meteor prototypes, are examples in this class. The former had main wheels retracting into the fuselage. This with a nose-wheel well ahead, meant a narrow track and long wheelbase—not good for ground manœuvring.

Another conception is exemplified in the German Ta 183 and certain Messerschmitt projects. In these the single unit was more or less underslung and the tail cocked up to clear the jet, a nose-wheel being housed on its side under the duct. Here again the low centre of thrust appears objectionable. The Vampire with its twin booms and tricycle is a much more attractive idea; and now we have the new De Havilland 108 tailless type with swept-back wings—the perfect case for the tricycle.



Showing the narrow stowage space on the Meteor for the sideways-retracting undercarriage. Accommodation in fuselage or nacelles was impossible.

The jet-fighter designers, indeed, have difficulties to overcome that had not been thought of a few years ago, and which are the less apparent in the finished product the better the job has been done. This is, perhaps, especially true of the single-unit machine, in which ducts, tanks, engine and jet-pipe take up so much room. Then there is the need nowadays for bulky cannon or rocket armament in place of mere machine guns. Wings are already becoming so thin that in general these things must be housed in the fuselage, which consequently has a tendency to grow in girth. The influence on undercarriage design is considerable.

The Historic "E.28"

The beginnings of this could be seen in the first British jet aircraft—the Gloster E.28/39, now in the Science Museum, South Kensington. The central duct in the nose divides into two main streams, between which the nose-wheel mechanism is poorly placed for access. Incidentally, steering by the nose-wheel from the rudder pedals proved very successful on this machine but complicated the mechanism. Perhaps the worst problem was to provide automatic disengagement of the steering on retraction and automatic re-engagement on lowering.

This more-or-less car-type steering once got the late Jerry Sayer round a nasty tight corner, but pilots do not seem in a hurry to see its general adoption on military aircraft with tricycles. One objection is that complications may arise from the use of the rudder in landing under certain conditions. The main legs are of the levered-suspension type, which enabled them to be kept short at the cost of high inflation pressure. A toggle-arm device attached to the oleo capsule causes a further shortening of the leg during retraction.

In the Meteor we come to a twin that has now proved itself in service under all conditions from sub-arctic to tropical. Access for servicing and maintenance is everywhere good—a state of affairs assisted by the outboard disposition of the units with their ducts and jet-pipes. Here again, as is well known, the main undercarriage employs the levered-suspension idea and the toggle-arm for shortening on retraction. The installation is necessarily somewhat heavy, but has the practical advantage of a square rig, made possible by the twin spars and compact stowage. Actually, undercarriage stowage became the criterion for locating the nacelles spanwise, since with jet units retraction into nacelles is impossible and there was no room in the fuselage.

In connection with the levered-suspension nose-wheel, used on a number of aircraft besides the Meteor, it can be stated that the trail of this type varies more with the ground reaction, especially over the taxying range, than in the case of straight or direct suspension. This affects steering and if higher loading conditions require an increase of inflation pressure in the oleo (nothing new in the aircraft world), the trail may vanish altogether, making turning on one wheel impossible.

Braking on the Meteor is confined to the main wheels (differentially for steering), as is almost universal. On the early machines braking also on the nose-wheel was employed, but gave so much trouble that it was discarded on the timely introduction of anti-fade brake-linings, which enabled the main brakes to contribute more and hold it. One of the worst snags with the nose-wheel brake was the effect of a momentary light reaction on the nose-wheel in pitch while the brake was on. This resulted in the

Gloster F.9/40 M with Metro-Vick axial-flow jet units. Note the low thrust line.

LANDING GEAR FOR JET FIGHTERS

locking of the wheel and the ruin of the tyre, the tread of which was scrubbed away.

It is of interest to note that nose-wheel braking on the little E.28/39 gave no trouble, but the brake torque available was small in proportion to the normal reaction. The Me 262 employed pedal-operated brakes for the main wheels, and there was a hand lever for operating a nose-wheel brake in emergency.

As we approach sonic speeds the problem of undercarriage design becomes increasingly difficult, especially in respect of the main legs. To say that the undercarriage may govern design is not much of an exaggeration. But this tendency must be quelled, for it is rightly argued that an aircraft is designed chiefly for air, not ground, performance.

The aerodynamicists want a mid-wing arrangement with wing envelope reduced in all dimensions, but particularly in thickness; and the designer may find himself choosing between a single-unit machine and a twin with inboard engines at the wing roots or side by side in a wide fuselage. If he tries an outboard twin the main wheels will almost certainly have to go into the fuselage or the units will be too widely spaced for quick rolling and one-engine flight, owing to the length of leg necessary for a mid-wing. Generally speaking there is no room to spare for main wheels in the large crowded fuselage, and if they were put there it might result in an uncomfortably narrow track.

Assuming that a central power plant is decided on, one is forced to the use of long slender legs with narrow high-pressure tyres retracting somehow into the wings and having a wide track. To avoid excessive blisters the stays must be attached high on the legs, which increases structure weight, and the provision of hydraulic and other mechanism calls for much ingenuity—bearing in mind that landing flap and air brake gear also require accommodation. The use of twin spars is practically impossible; the power plant must be located close behind a single main spar at about thirty or thirty-three per cent of chord.

All this results in a main undercarriage that is probably no lighter on account of any leg shortening due to the absence of an airscrew. Moreover, the need for a nose-wheel adds weight, on the assumption that, if using an airscrew, one would have fitted a tail-wheel. As tyre pressures continue to increase more work will go into the oleos or other springing media—unless the structure is strengthened. There are snags either way.

Another problem with the thin mid-wing arrangement is the effect of differential deflection. Such wings are necessarily somewhat flexible under load; but the retracted undercarriage legs, themselves unloaded, remain straight as the wings deflect. Even under small accelerations this may cause serious secondary stresses and gaping doors, if mechanically connected to the undercarriage, unless suitable care is taken in the design.

Flap Operation

Flaps are an essential feature of landing gear to-day. So much so, indeed, that slim, low-drag fighters with tricycles could never hope to put down anywhere but on a long runway or airstrip without flaps fully lowered. The stage has been reached, it appears, when priority should be given to lowering of flaps rather than undercarriage, with possible effects on emergency provisions. On the jet fighters envisaged now it will be easier to make a belly landing with flaps than an undercarriage landing without. In this connection it may be mentioned that emergency lowering by compressed air for flaps and undercarriage, with gravity assistance where possible, remains one of the cleanest and most effective methods. The tendency towards still higher hydraulic pressures is to be deprecated on this account, owing to the reasonable limitation of stored air pressure in R.A.F. machines to 1,800 lb/sq in.

Electrical operation of services is receiving increased attention, but on the score of weight electrics have a long way to go before they can compete successfully with hydraulics or pneumatics for heavy duties.

In these notes American jet fighter developments have not been discussed. They are following, of necessity, the same general trends. The McDonnell Phantom deck-landing fighter with twin units close inboard, the Republic Thunderjet and the Lockheed Shooting Star are examples, affording slightly different solutions to the same puzzle.

Eleven-ton Single-seater

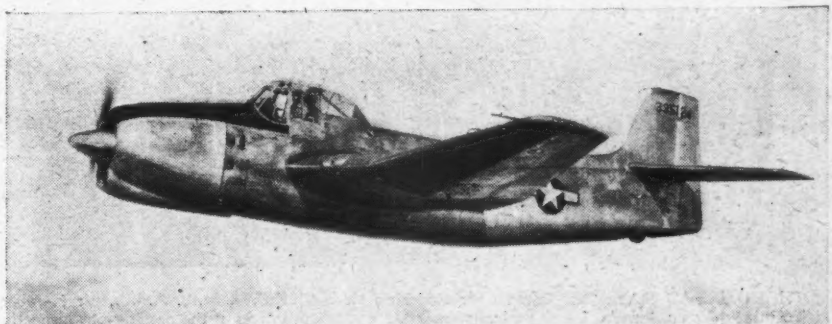
A Specialized Army-Support Aircraft with Heavy Armament Load

THE XA-41, built by the Consolidated-Vultee Corporation and first flown during 1944, is of particular interest among military aircraft for two reasons: first, it was developed solely for the close-support of ground forces, and secondly, for a single-seater, is of exceptional size and weight.

Possibly inspired by the IL-2 (Stormovik), though there is no indication that armour protection is so comprehensive as on this Russian aircraft, the XA-41 is said to have proved highly successful. It was not produced in quantity due to the progress and character of the war, and possibly because of the remarkably good results obtained with standard single-seat fighters adapted for close-support work. Spitfires, Hurricanes, Mustangs and Thunderbolts were all used extensively for the attack of ground targets, but perhaps the best-known British "attack-fighter" was the Hawker Typhoon, later followed by the Tempest.

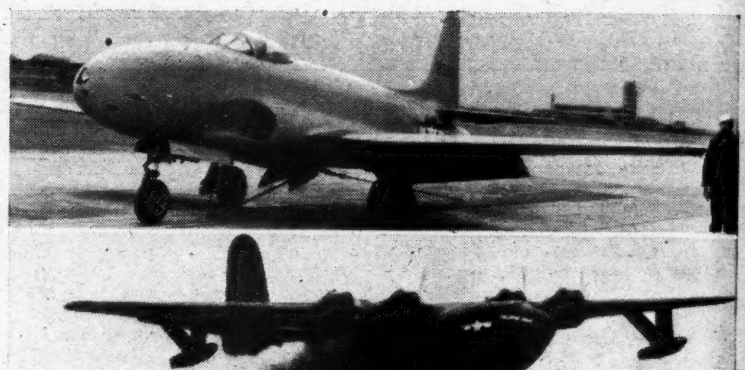
Powered with a single Pratt and Whitney Double Wasp engine of about 3,000 h.p., the XA-41 has a top speed of 363 m.p.h., a "combat range" of 800 miles and a service ceiling of 29,000ft. The span is 54ft (more than 12ft greater than that of the Typhoon), and the gross weight 24,188 lb—over double that of the Hawker. Thus it is one of the largest and heaviest single-seaters yet constructed.

Contributing to the weight is a bomb capacity of 6,400 lb, which may consist of small fragmentation bombs, heavy bombs or a torpedo. The built-in armament comprises four 37mm guns and four 0.5in guns fixed in the wing.



Strength and utility, rather than aerodynamic efficiency obviously governed the design of the XA-41.

HERE AND THERE



ALTERNATIVE METHODS of producing what the Americans call a "jock-rabbit start" (Top) A Navy P-80 with deck-accelerator gear, and (bottom) jet-assisted take-off, known as "Jato," using two batteries of six rockets applied to the 70-ton flying boat, *Philippine Mars*.

R.A.F. Helps St. Dunstan's

A CHEQUE for £126,000, the balance of the sum of £128,000 raised by the R.A.F. on behalf of St. Dunstan's, was handed to their chairman, Sir Ian Frazer, M.P., by Marshal of the R.A.F. Lord Tedder at the Air Ministry last week.

This handsome donation is a result of various events organized by the home and overseas commands of the R.A.F.

Visitors to Britain

TWO parties of foreign visitors who recently arrived in Britain, each of significance though quite independent of each other, are the Sudanese newspapermen, and the Swiss aircraft mission, which included the R.A.F. Station at Moreton Valance in its itinerary. Two of the four Swiss visitors are test pilots.

The Sudanese party numbered five of that country's leading journalists, four of whom are graduates of the celebrated Gordon College, and they came to see for themselves how British industry is coping with all her present day problems.

On their tour they visited Airwork, Ltd., at Gatwick, in whom they have a special interest since this concern has been entrusted by the Sudan Government with the flying and technical services of the newly formed Sudan Airways which will use D.H. Doves.

"Flying Doctors" Again

THE Australian Health Department is reinstating the celebrated "Flying Doctor Service" for the remote Northern Territories which was necessarily suspended during the war.

The scattered inhabitants of these isolated homesteads were not deprived of this valuable safeguard when hostilities broke out, because the R.A.A.F. took over and carried out all the normal duties of the flying doctors.

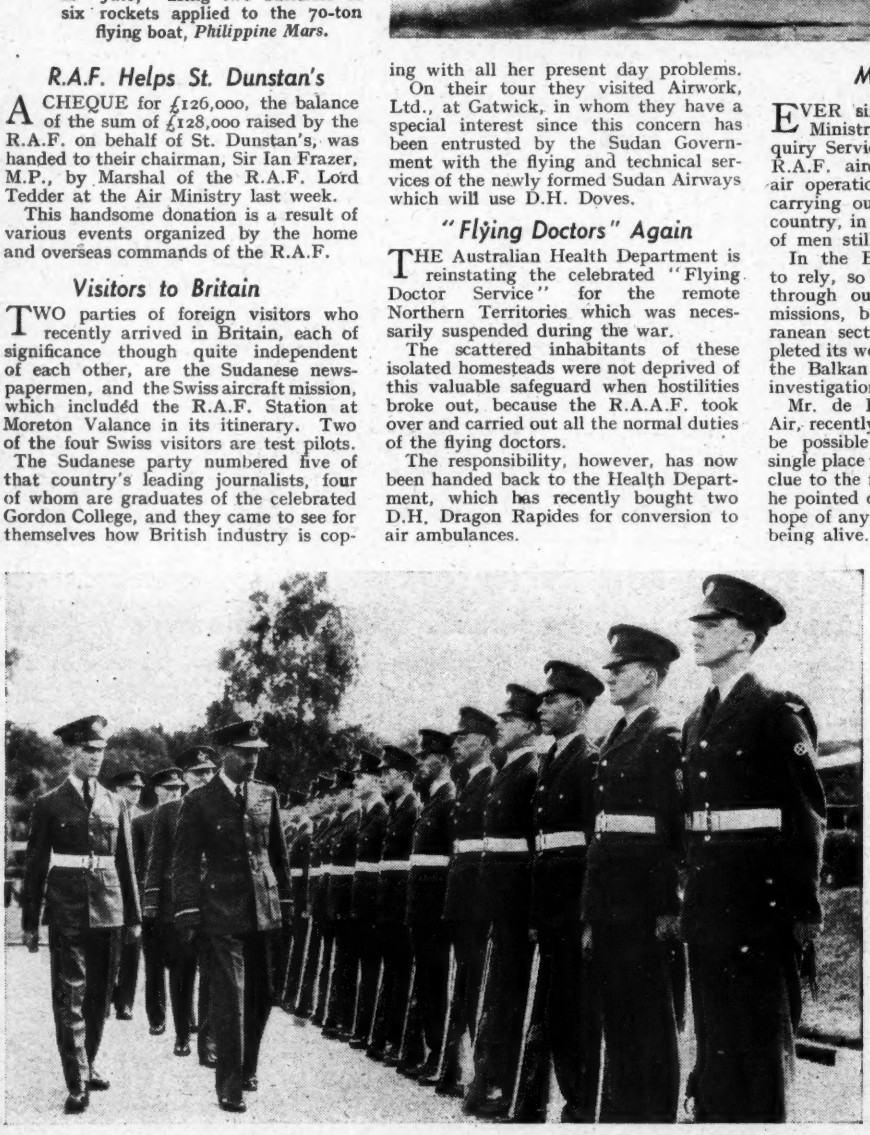
The responsibility, however, has now been handed back to the Health Department, which has recently bought two D.H. Dragon Rapides for conversion to air ambulances.

Missing Airmen

EVER since October, 1944, the Air Ministry's Missing Research and Enquiry Service has been at work tracing R.A.F. aircrew reported missing from air operations, and they are still at it, carrying out investigations country by country, in an effort to find out the fate of men still unaccounted for.

In the Balkans the Service has had to rely, so far, on any reports coming through our own military or political missions, but as soon as the Mediterranean section of the Service has completed its work in Italy, it will move into the Balkan countries to make its own investigations.

Mr. de Freitas, Under-Secretary for Air, recently said that he hoped it would be possible eventually to cover every single place where there was a chance of a clue to the fate of a missing airman, but he pointed out that there was very little hope of any of those so far untraced still being alive.



THEIR GREAT DAY: Air Marshal Sir Roderick M. Hill, K.C.B., M.C., A.F.C., Air Member for Training, passes down a line of typically smart Aircraft Apprentices at the passing-out inspection of the 47th entry at Halton—the first to be instructed on gas turbines and jet aircraft.

Slight Misunderstanding

THE enthusiastic pride of a newly created father led to an amusing incident on the K.L.M. service between Croydon and Amsterdam recently.

Capt. Frank Holleman, one of the line's pilots, learnt on bringing his aircraft in at Croydon that his wife, who lives in England, had just presented him with a daughter.

Well, you know what brand new daddies are! When Pop Holleman was in the air again half an hour later making the return flight, he contacted Amsterdam on his radio in the usual way, but couldn't resist the temptation to boast about the new babe, so added this news item to his routine message.

Maybe he was a bit incoherent with joy, but the folks at Amsterdam got the idea the infant had been born in the air-

HERE AND THERE

craft, with the result that when the airliner touched down at the Dutch airport the authorities there had an ambulance, nurses and press photographers all laid on ready.

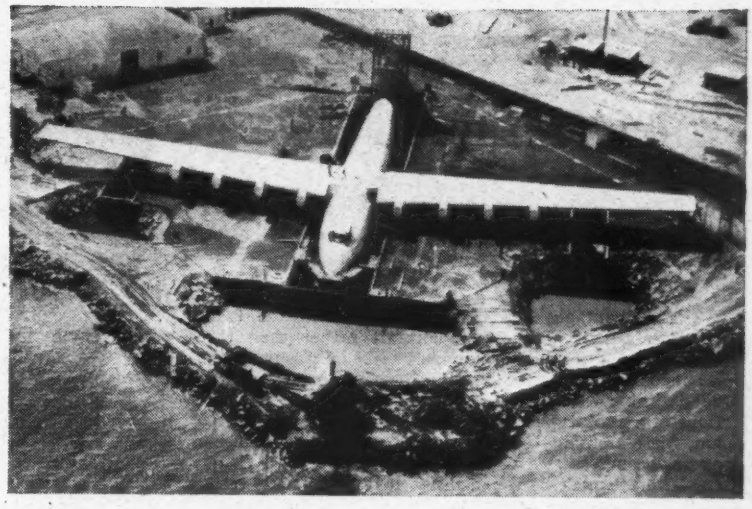
Funnily enough, there *was* a baby among the passengers, who received quite a lot of excited attention until somebody found he was four months old!

Cost of Comfort

BY having only 46 seats instead of 58 in their DC-4s operating between New York and Miami, U.S. National Airlines are reported to sacrifice about £300 on each daily round trip between these two points.

The cost, however, is not regarded as a loss, but is charged up as an investment in goodwill because the added comfort is so much appreciated by passengers.

Most British airline passengers would be quite well pleased if the same policy were followed even in regard to the motor coaches which take them out of London to the airport!



BIGGEST BOAT: Taking shape in a graving dock at Long Beach, California, the Hughes flying boat, the world's largest aircraft, displays its 320ft. wooden wing and the spacing of the nacelles for its eight Double Wasp engines. Scaffolding behind shows that the tail is being assembled.

News in Brief

K.L.M. has opened a traffic and publicity office in the Hollywood Roosevelt Hotel at Los Angeles, and is the first "foreign" concern to do so in this Californian city.

* * *

Nearly 5,000,000 letters a day, representing approximately 1,000,000 lb of mail a month, are flown by R.A.F. Transport Command throughout the world. Last year nearly 20,000 tons of air mail were delivered.

* * *

A director of the Churchill Machine Tool Co., Ltd., since 1923, Mr. H. H. Asbridge, M.B.E., M.I.Mech.E., has died at the age of 71. He was a recognized authority on precision grinding.

* * *

A Lille-London air service is to be started on September 1st by a company formed by ex-pilots of the French Resistance movement and the Fighting French Air Force. Later this service will link up with others to Manchester, Brussels, Amsterdam and Lyons.

* * *

Owing to the degree of public interest being displayed in the exhibition of scale-model aircraft, old and new aircraft engines, and veteran motor cars in Rootes' Piccadilly showrooms, London, it has been decided to extend it until Wednesday, August 14th.

Howard Hughes, the American millionaire sportsman, pilot, film-producer, and president of the Hughes Aircraft Company which is building the giant flying boat pictured above, is reported to be recovering slowly from the injuries he received in a recent flying accident. He was piloting a photographic aircraft on its maiden flight when it crashed into the roof of a house.

* * *

Incidentally, insurance totalling nearly £5,000,000 is being asked for the first flight of this monster aircraft, according to reports in Los Angeles, and Lloyd's (London) are said to have taken £600,000. Another £500,000 towards the required total has been accepted by a number of domestic firms—which only leaves £3,900,000 to find!

* * *

An A.T.A. pilot in the early days of that organization, Mr. M. L. Bramson, a member of the Cambridge Flying Club with business interests in various parts of the country, is the first civilian to buy a Spitfire for private use. Mr. Bramson is now in his "fifties."

* * *

The R.A.F. depot and maintenance unit at Kidbrooke, near Greenwich, is to be closed, the Air Ministry announced last week. The official statement also referred to a "broad plan" for absorbing as far as possible redundant labour into new employment at Kidbrooke.

The College of Aeronautics wish to make it clear that they are not setting up a special training scheme for disabled workers. The omission of a vital comma from reports of Miss Ellen Wilkinson's speech during a recent debate on education in the Commons conveyed the mistaken impression that the college was taking this course.

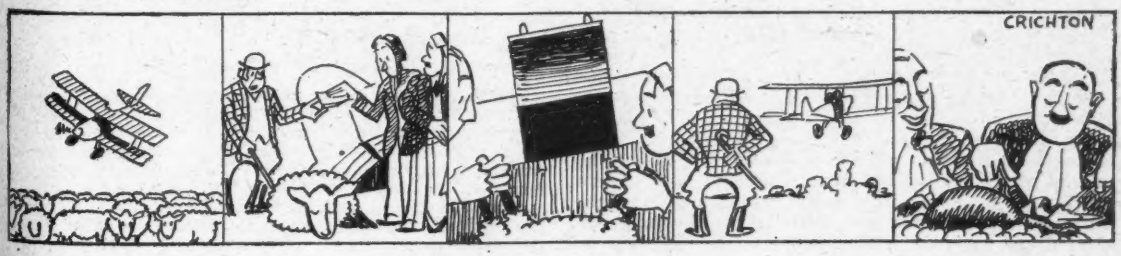
* * *

Air Vice-Marshal Robert Stanley Aitken, vice-president of the British Institute of Radio Engineers, has been appointed to the board of Radio and Television Trust, Ltd., as a full-time director, and will be occupied with general administrative matters for the RadioTel Group. He joined the R.F.C. in 1916 as a pilot and retired from the R.A.F. on July 19th last at the age of fifty.

* * *

Given up for lost in the bushlands of Northern Ontario after his Gloster Meteor disappeared on June 29th, Flt. Lt. W. H. M. McKenzie, R.C.A.F., turned up last week at a camp on the shores of Black Lake, uninjured but very hungry. He had lived on berries, roots and small game and had lost 47 lb in weight during his trek through the forests. Air Force machines had ranged over thousands of square miles of bush for a fortnight in an attempt to locate the wreckage of his plane, but though McKenzie kept fires burning by it for 26 days they were never sighted.

AIRSTRIP . . . No. 26



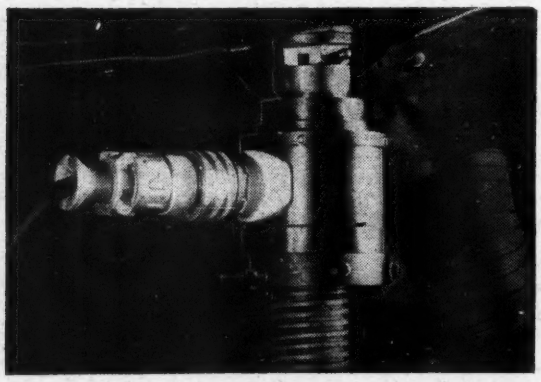
Portable "Weighbridge"

Strain-gauge Method Used in Compact Equipment

THE advantages obtained from the ability to take the weighbridge to the aircraft rather than the reverse, are tolerably obvious. Not only is it sometimes inconvenient to move aircraft, but it is also very often desirable to obtain the structure weight of various sections of a prototype during the process of construction. Again, there are many occasions when, following modifications or the necessary work involved in renewing a C. of A., an aircraft must be weighed and a fully portable type of equipment will be of considerable advantage.

In the American Cox and Stevens electronic weighing kit, the agency for which has been acquired over here by British Aviation Services, a now well-proved system of strain-gauge recording is used. Small cylindrical "cells" are placed between the jack heads and the three aircraft jacking points, and the readings from these are separately recorded on the main instrument. These "cells" are, essentially, spring balances of a rather unusual type in which the springs are, in fact, short steel columns. When these columns are compressed, resistance wire strain-gauges determine the very small deformations with varying loads.

Naturally enough, the method of recording the resistance variation must be comparatively involved, since the changes are extremely small (10,000th of an ohm) and cannot be measured by normal means, while allowance must be made for the additional and varying resistances of the plugs and contacts connecting the cells with the recording instrument. For this reason, a four-arm bridge



One of the three strain-gauge cells shown in position at the jack-head.

network is used. This is unbalanced under load, and any changes in the incidental resistances affect the result only in proportion to the total bridge resistance. The small voltage output is then measured by electronic means.

Before weighing starts, each cell is adjusted to give a neutral reading on the electronic indicator. The aircraft is then raised on the jacks with the three cells resting between the jack heads and the necessary adapters at the jacking points. The needle is then brought back to zero for each cell in turn and the weight read off on the weight dial. After the figures have been taken, the jacks are lowered and the zero weight reading is again checked to make sure that nothing has changed during the process.

The complete weighing kit is carried in a normal-size suitcase, with the cells, necessary adapters and measuring gear.

Given reasonable conditions, and an aircraft with convenient jacking points, the entire process can be completed in little more than half an hour, and most of this time is, of course, taken up in the business of ensuring that the loads are accurately distributed. During a demonstration with British Aviation Services' own Airspeed Consul, the work was completed quite quickly, and the figures obtained were 3,200, 3,012 and 163 lb—making a total of 6,375 lb. The variation between the port and starboard figures was caused by the fact that the Consul was ready for flight, and the fuel loading was unbalanced.

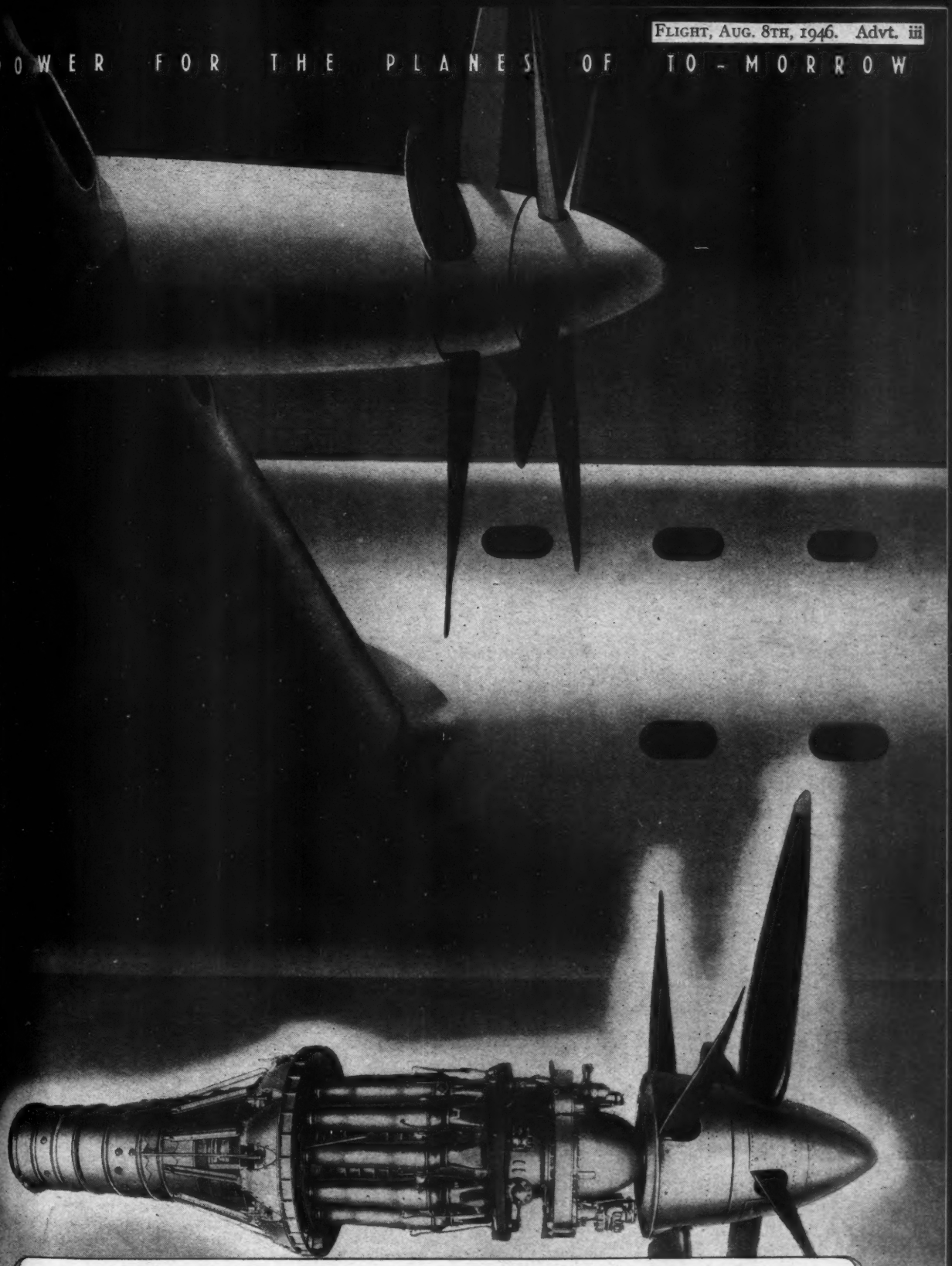
The complete set, which is carried in a normal-size suitcase, includes accessories such as levelling bars, measuring tape and plumb lines, to enable the operator to determine the centre of gravity, and the power required is taken from the aircraft's normal 24-volt battery, or from a battery cart. Suitable jacks are normally available at the scene of the weighing, and the set also includes the necessary jacking point adapters for all types of American aircraft. Unfortunately, our own aircraft types are by no means so conveniently standardized in this matter, and British Aviation Services have made a large number of additional adapters as well as a simple attachment to enable the same type of cell to be used when an aircraft part, or its tail, is sling-hoisted. In order that there should be no recording errors, the cells, cables and instrument controls are each colour-coded.

The weight of the entire kit is in the region of 50 lb, and the maximum test errors are less than 5 lb at reasonably low maximum figures. Each cell is capable of recording loads up to 50,000 lb. The set we saw was designed for recording a maximum three-point weight of 75,000 lb. At present there are only two of these kits in the country, but B.A.S. are obtaining a limited number of further sets. In the meantime they are instituting a system whereby they can proceed with any necessary weighing at any factory or airfield in the country.

FLETCHER AIRSCREWS

HIS many friends in the industry will be interested to learn that Mr. A. A. Fletcher has resumed airscrew design. It may be remembered that during the war Fletcher-designed airscrews were used on Tiger Moths, Magisters and Messengers, Auster IVs and VIs, and Oxfords. Under the title "Fletcher Airscrews," a division of Philidas, Ltd., the firm will design and manufacture wooden airscrews, specializing particularly on light aircraft types. The offices and factory are at the Aerodrome, Reading.

POWER FOR THE PLANES OF TO-MORROW



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NEW YORK TERMINALS

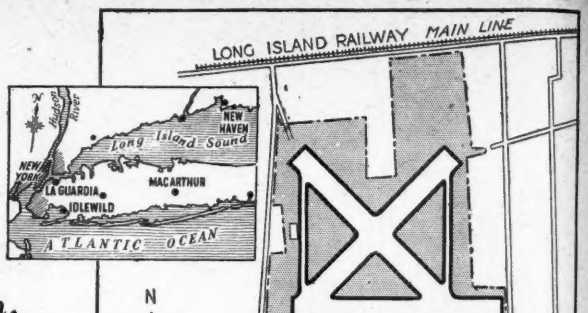
Some Comments on Congestion, Costs, Problems and Politics : Idlewild and Islip

THERE has been a tendency to compare the present airport positions in England and America to the detriment of this country, but while it is true that there are a number of large, well-equipped airports in the United States, superior in most ways to our own, the volume of traffic there is such that their present problems have become even more critical than ours. New York in particular suffers from inadequate airport facilities, while a number of the larger cities are severely handicapped for the same reason.

On several occasions we have ventured to comment on these shortcomings, with particular reference to saturation at La Guardia ; similar conditions exist at the excellent but overtaxed airport at Washington.

On a recent visit to America, *Flight's* representative spent some time at La Guardia airport and discussed the traffic problems with the manager, Captain Kenneth Behr. The opportunity was also taken to study similar problems at Washington airport and to examine the progress made towards the use of Idlewild and Islip (MacArthur field).

There is at present a friendly rivalry going on between La Guardia and Washington to see which will handle the greatest amount of traffic, and the figures achieved during the fine summer weather are quite staggering. Until recently La Guardia's peak day, May 24th, saw 796 landings and take-offs, nearly all of which were made during daylight hours. Washington on its busiest day had 743 movements. During peak periods of the day, in good weather, Washington claims it has been found possible to handle three aircraft per minute. At La Guardia peak loads for any period of sixty minutes are shown as 67 aircraft.



A possible terminal for the B.O.A.C. New York service, is the MacArthur or Islip airport. Its location, 56 miles from New York, on Long Island, is shown on the inset map.

A steady increase in monthly figures has occurred during 1946. La Guardia figures show 14,341 arrivals and departures for January and 17,517 for May. June and July figures will show a considerable further increase. Washington's May figure for comparison was 16,800. La Guardia detail traffic figures for the first five months of 1946 appear in the accompanying table.

AIRCRAFT MOVEMENTS IN AND OUT OF LA GUARDIA AIRPORT

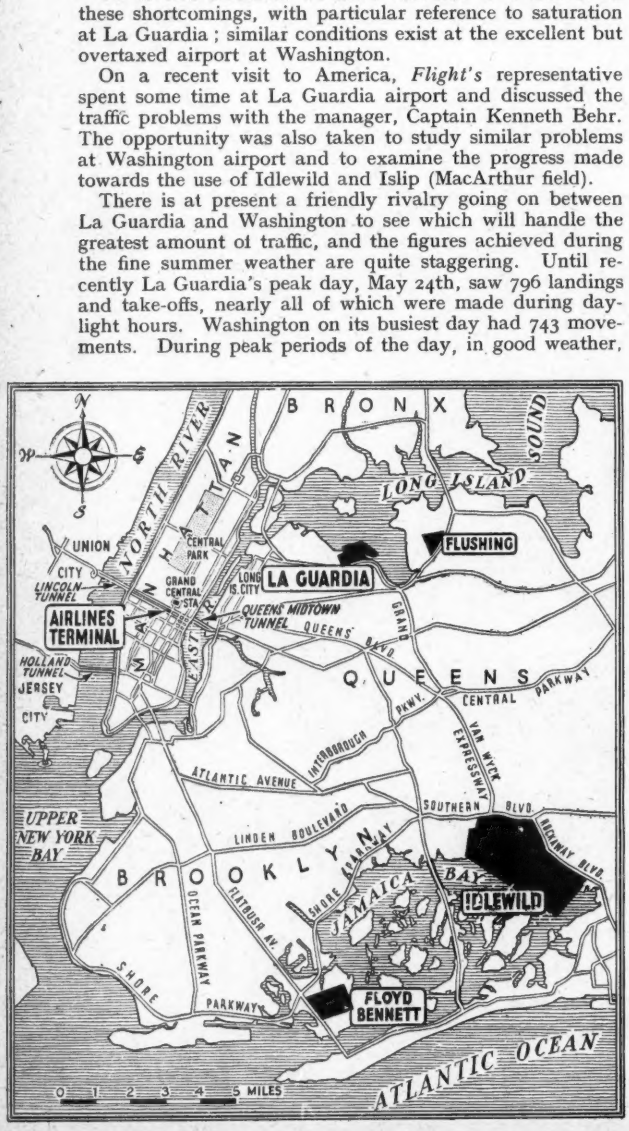
Traffic	Jan.	Feb.	March	April	May
Scheduled air lines	10,388	9,220	11,451	12,176	12,342
Military aircraft	1,002	753	438	417	379
Civil aircraft (other than scheduled airlines, including personal aircraft and charter services)	845	792	1,375	1,501	2,008
Local traffic (including airline test flights and training) ...	2,108	2,022	3,422	2,936	2,728
Monthly total	14,343	12,757	16,696	17,030	17,517

To complete the picture the chief types of aircraft must be considered, and an analysis shows that the average approach speed is 120 m.p.h. and the average weight 25,000 lb. This means that about eighty per cent of the scheduled airline traffic at La Guardia is represented by 21-passenger aircraft of the DC-3 type. The remainder are four-engined DC-4s, Constellations, etc.

The problem is what to do when the present peak good-weather traffic densities have to be increased and, even more important, what to do when bad weather and seasonal low visibility increases handling time to, say, one aircraft per three or five minutes.

It seems that the traffic pressure will have to be progressively reduced in a number of ways, the chief of which, according to the importance of the service, will be: (a) short delays over terminal (handling time being reduced somewhat by the use of the latest radar and radio equipment to give closer control on the circuit and approach); (b) diversion to nearby alternative airports; (c) diversion to airports at surrounding cities; (d) cancellation of services.

The old optimum-size controversy is as lively as ever at present, but the "smaller aircraft with more frequent service" supporters are in a rather weak position with regard to airport congestion, as the "large aircraft" fans naturally point out that with aircraft of three times the



The New York area and its airports. The areas covered by La Guardia and Idlewild are shown to scale in black with the Floyd Bennett field for comparison. The B.O.A.C. office is a few hundred yards from the Airlines Terminal in the "middle" of the city and about 35 min. drive from either civil airport.

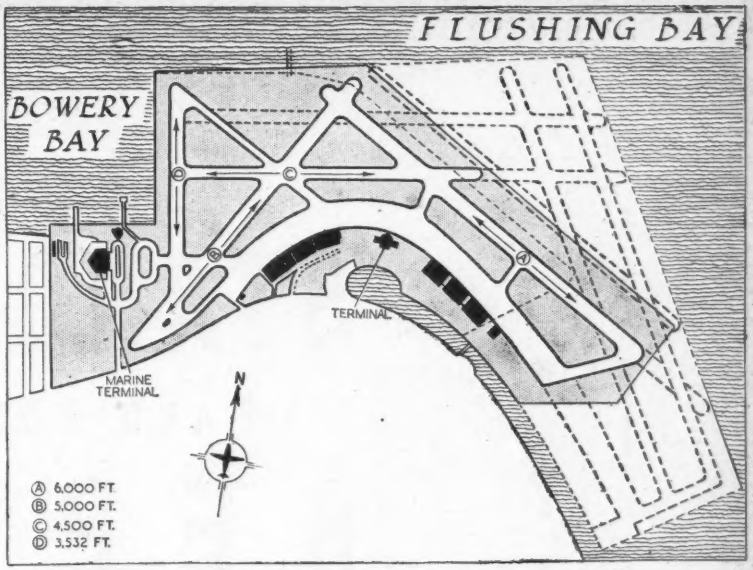
capacity, triple the number of passengers can be landed and picked up at a terminal in a given time, landing and take-off times being about the same for, say, 20- and 60-passenger aircraft of present conception. During the summer months the frequency of service is probably the more important consideration.

On internal routes over short distances, delays before take-off and landing quickly cancel out any advantage of air travel, leaving only the disadvantages; while on cross-ocean services, passengers who have paid for speed feel that they have a grievance if delays occur. An example of delay on the ground at La Guardia was recently quoted. A Constellation was kept waiting 1 hr 14 min and as a result wasted in that time about 100 gallons of fuel. This is only a fraction of what would have been the airborne consumption for a similar period, and it is obvious that there is a limit to what the airline operator can stand in the matter of delays.

Diversions do little towards solving the problem, for neither the local nor the long-distance passenger is going to be pleased with arriving at some airport 100 miles from his expected destination.

Our immediate concern in this country at the present time is how to avoid delays on the B.O.A.C. New York service: an alternative airport reasonably near New York seems to be the answer.

At present passengers for all domestic airlines are handled at the main La Guardia Terminal; the transatlantic services arrive and depart from the La Guardia Marine terminal. The immigration formalities—and mere formalities many of them seem to be—take as long as two hours for completion. This is due to the increase in traffic without an appropriate increase in staff and facilities.



La Guardia or North Beach airport is already overcrowded and traffic densities have reached a good-weather maximum. Internal airlines use the main Terminal buildings and trans-ocean services the Marine Terminal.

Idlewild and Islip

Two airports which have been widely discussed recently are the nearby Idlewild, and MacArthur military field at Islip. The map of Idlewild shows the progress to date, and if labour and financial problems can be solved this field could be put into limited use almost at once. Buildings would be of a temporary nature, but the three existing runways are available and serviceable and there is a temporary control building.

Originally the total cost of Idlewild was estimated at $71,000,000 (£17,750,000) and the following additional data will be of interest:—

Area, 4,527 acres (La Guardia occupies only 550 acres, and The London Airport occupies just over 4,000 acres).

Runways, 200 ft wide, 12 in thick, to take aircraft weighing up to 150 tons.

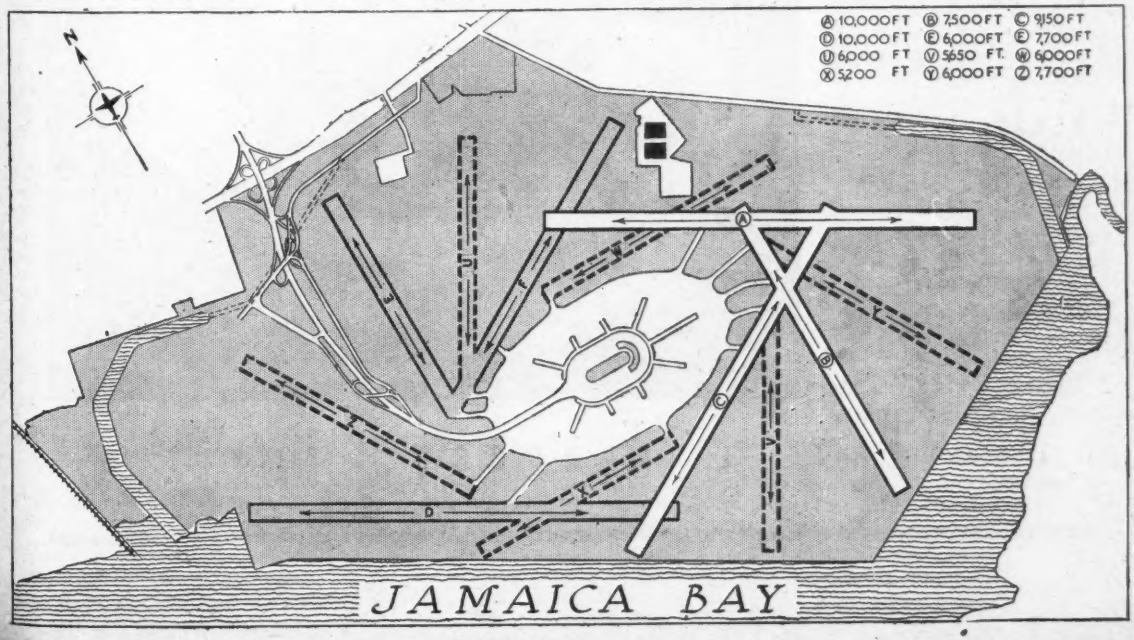
Taxi strips, 100 ft wide, 14 in thick

Anticipated peak movements (take-offs and landings): 1st year, 84 per hour; 2nd year, 149 per hour; 5th year, 208 per hour; 10th year, 313 per hour.

All short-range New York services with a radius as far as Chicago (approx. 750 miles) would continue to use La Guardia; all others, Idlewild.

The political issues involved in building an airport of this nature are strange to this country. Two weeks ago, in a most vitriolic article in the American newspaper *P.M.*, ex-Mayor La Guardia attacked the present set-up. The burden of his argument was that he and his administration had made New York the commercial air centre of the world, providing the North Beach (La Guardia) airport when previously New York traffic had all gone to Newark, New Jersey. This airport, municipally owned and operated, was

At Idlewild three runways (in white) are now completed, and two hangars (black) have been commenced. The field will not be in use for at least three months. The runways in dotted outline are for future expansion, but it is planned to construct the remainder as soon as possible.



A·E·C
A L V I S
ARMSTRONG SIDDELEY
ASTON MARTIN
A U S T I N
B E D F O R D
B E N T L E Y
C O M M E R
COVENTRY CLIMAX
D A I M L E R
F O R D
F R A Z E R - N A S H
H I L L M A N
H U M B E R
J A G U A R
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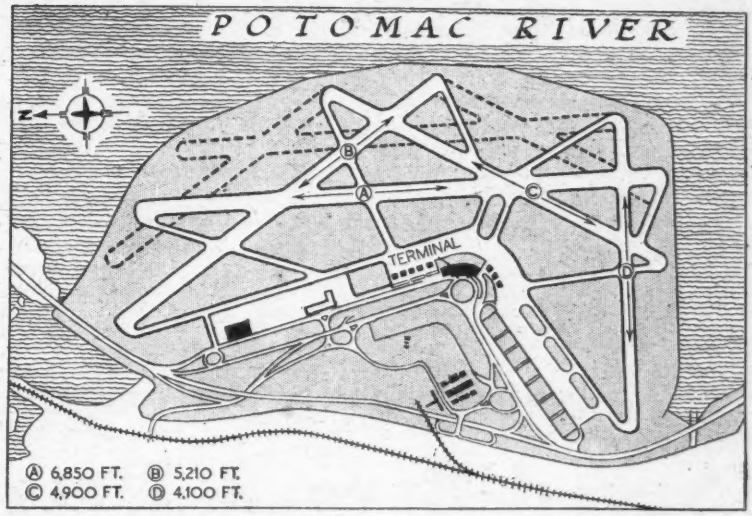
NEW YORK TERMINALS

a sound proposition, producing an annual revenue of $800,000. Foreseeing the expansion and present congestion, Idlewild airport was planned and construction was started on the same basis. The new administration, he claims, is now changing the whole scheme into a money-making project for a bunch of bond holders at the expense of the City of New York.

There was some opposition earlier on the score of unsuitable weather and location. Idlewild is quite near the Floyd Bennett Military Field on the reclaimed shore of Jamaica Bay, on the Atlantic coast of Long Island. When Mr. La Guardia gave up office, opponents of the scheme were left with a part-finished project which they had opposed. Almost at once an honorary Airport Authority was set up to take over this embarrassing baby, and after the passing of a bill, New York legislation now provides for this Authority to construct, finance and operate the two airports and any future airports, and authorizes the issue of bonds to the value of $250,000,000. This independent authority was composed of gentlemen no less important than General J. Doolittle, Harry Guggenheim (chairman) and Laurence Rockefeller, and the terms provide for various periods of office from four years upwards. Recently General Doolittle resigned on the grounds that he was vice-president of a contracting company and because of pressure of work in Europe. Mr. La Guardia suggests other reasons. Commissioner of Marine F. G Reinicke has been appointed to the Authority in his place, but more recently the resignation of the chairman, as predicted by Mr. La Guardia, has been reported.



Washington Airport, actually situated over the border in the state of Virginia, is one of America's busiest airfields. Possible extensions at Washington and at La Guardia, illustrated on previous page, are indicated in each case by broken lines.

Cost and Revenue

Without plunging too deeply into the political ramifications, the position following the change-over of administration may be summarized as follows: Who continues to pay interest on money so far raised by the City for the La Guardia and Idlewild airports? Who outside the City should provide the rest of the money and at what rate of interest? How are the bond holders and the City to divide the revenue from the two airports? At present it appears that the City is to continue to pay the interest on the original loan, but the airports and all revenue are to go to the Authority and its backers.

Another body to take an interest is the Citizens Union of New York, who also oppose the Airport Authority and want the Port of New York Authority to take over, pointing out that their strong financial position would enable them to issue airport bonds at a rate comparable with the original City issue, namely less than 2 per cent. This point was in part an answer to present Mayor O'Dwyer's statement that the City had no more funds beyond the $30,000,000 paid out and the further sum encumbered. So far, incidentally, Idlewild has cost, or contracts have been given, to the value of about $60,000,000 (£15,000,000).

One trouble, which directly affects the airlines, is the matter of their terms, rates and rents at Idlewild and La Guardia, which were negotiated and contracted before the existence of the Authority, and which the Authority now wish to change. Legal loopholes are being sought, airport as opposed to seaport regulations picked over, and a lot of trouble stirred up. The thirteen U.S. and foreign air lines companies concerned opposed the introduction of this un-elected Authority. The original bill was only passed by one vote over the minimum majority that is required.

The airlines and other companies holding concessions see themselves having to pay out more dollars, while Mayor O'Dwyer replies by quoting discrepancies in rents and saying that all valid contracts will be honoured and others re-negotiated. The terms of a forty years' lease between City and Authority have yet to be settled, and signed. October 1st is the day named for the Authority to take over, and the present lack of direction accounts to a great extent for the negligible progress at Idlewild during recent months.

To complicate matters further, at Idlewild, union disputes are understood to have prevented the installation of power and telephone lines. The only statement made recently was to the effect that immediate use of the runways would "delay completion" and that the earliest date for limited use would be November 1st.

In the meantime, B.O.A.C. have been investigating the use of Islip for a near New York terminal. Possible use would be dependent upon various agreements, co-operation from the Health and Customs authorities, and the installation of essential equipment.

Islip is 56 miles north of New York, but it is felt that landing and reception without delays, followed by a 90 minute coach journey, would be preferable to long delays prior to and after landing, each of which would probably amount to two hours. It should be mentioned that there is already a 35-minute coach journey from La Guardia to the Airways Terminal near the Grand Central Station in New York proper to be taken into consideration.

Airborne Customs

The ideal arrangement with regard to Health and Customs would no doubt be the airborne official who boards the transatlantic aircraft at Gander and completes all formalities by the time the aircraft lands on American tarmac. In the same way, although much less time is taken at the London Airport, British Customs officials might board the plane at Rineanna.

With nationalized airports the revenue is of no great interest to the individual; it was most interesting, however, to examine detailed revenue statements for Washington and La Guardia airports. In particular the Washington manager's view on profits from concessions would have been of great interest to the managers of some of our municipal airports. Below are quoted some unexpectedly large items in the revenue statement included here as an indication of how an airport is made to pay. The figures

NEW YORK TERMINALS

are for Washington airport for the year ending July, 1945, and therefore cover many war months.

	Dollars
Buildings rentals	34,843
Hangar rentals	82,117
Fuel concession	150,000
Airport transport (taxicab)	19,986
Restaurant	20,542
Coffee shop	22,604
Tobacco and news-stand	4,987
Souvenir shop	1,105
Barber shop	965
Utilities (telephones, steam, power, water)	88,223
Total receipts	594,725

In addition to the variety of items listed above, the revenue is swelled by such things as a moving electric news strip, which includes advertisements, and by various slot sales machines. Later an automobile service station may be built.

On the expense side by far the largest single item is Personnel Services—$369,943, while the total net expenditure for the period is $542,725. A profit of $52,495 (£13,124) is therefore shown and it is what may be called incidental items which provide a great part of the profit.

Pre-war, the Airport Hotel at Croydon was very popular, and airport hotels all over America are very well patronized. Wherever there is flying in progress a crowd of sightseers collects. In this country we could well afford to encourage this interest to the benefit of the airports and of the aviation industry generally by providing our air terminals with observation rooms, public lounges and restaurants, garages and filling stations, either as an offshoot of the basic organization or on a concession percentage profit basis.

M. A. S.

Speed-Record Preparations

August 20 Now Approximate Date : News from Tangmere and America

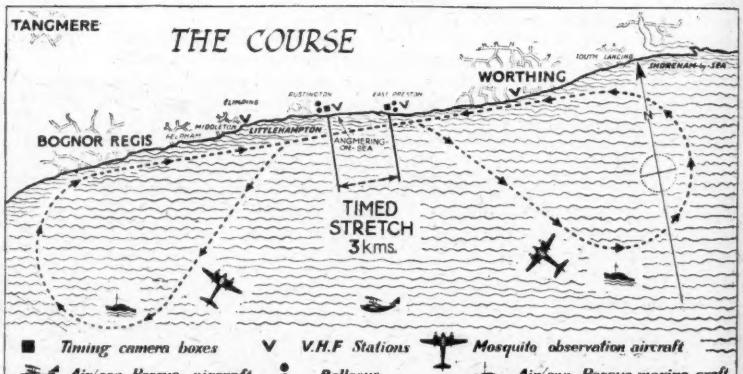
UNTIL the latter part of last week the Air Ministry still hoped that Meteors of the High-Speed Flight might attack the world's air speed record on or about August 15th. It now seems reasonably certain that the bid will not occur before the 20th and may well be later, for a hot day is essential and heat must be associated with an on-shore wind, good visibility and a high tide, the last to eliminate the possibility of bumps rising from the hot sand, for the tide recedes a great distance at some points.

Heat and Speed

As for heat, Grp. Capt. Donaldson, who has now been instructed to prepare a paper dealing with the problems of high-speed flying, tells us that a drop of 1 degree Centigrade below the optimum 30 deg means a loss of 1 m.p.h. ; thus the day before our last visit to Tangmere, with the temperature at 19 deg C, he dropped 11 m.p.h. on one of the "hack" Meteor IVs.

The Course Controller, Wing Cdr. A A. McGregor, Staff Officer to C.S. (Air), has announced that the timing arrangements will be little different from those at Herne Bay. Specially adapted F.24 reconnaissance cameras will check the 16 mm cine cameras. They will be supervised by Mr. Goldsmith, of R.A.E., who is now established with his team in the master timing box at the eastern end of the 3-km stretch. Flt. Lt. Evason, of the Balloon Research and Development Establishment, Cardington, is again responsible for the marker balloons at each end of the course. Night-fighter Mosquitos of No. 29 Squadron, West Malling, will carry sealed barographs and act as observation aircraft to certify that the Meteors do not exceed the specified 400 metres at any point. Air/Sea Rescue is represented by a Sea Otter which will circle out to sea and operate in conjunction with two A.S.R. marine craft. Marking and mooring arrangements are virtually complete after collection of buoys, bombing targets and salvage camels from around most of the English coast. The urgency and scale of this round-up of gear recalled a special wartime operation and reflects great credit on Messrs. Cope and Wilson, seconded from the Ministry of Supply.

Meantime the B.B.C.'s correspondent in America reports that preparations for an attack on the record by a heavily modified Lockheed Shooting Star are well advanced. This machine may have a nose intake and a modified wing. As announced last week, the Republic Thunderjet may also make a bid, but such information as is available on the American preparations and intentions suggests that either of these single-jet machines will be hard pressed to approach within several m.p.h. the speeds (of the order of 630 m.p.h.) already attained by Meteors on test, as recorded in *Flight* last week.



The location of the 3-km. timed stretch, flanked by balloons and timing camera boxes, is clearly indicated on this sketch-map. Mosquitos will check the height of the Meteors and a Sea Otter will patrol in case of a ditching.

The two High-Speed Meteors, EE549 and EE550, may have been delivered to Tangmere by the time this is read. Their Rolls-Royce Derwent V turbine jets will be standard production units adjusted to deliver up to 4,200 lb thrust.

BACK TO NORMAL

PRE-WAR private owners and others who knew Hanworth primarily as a combined airfield and country club will be glad to know that the Hanworth Park Hotel has been reopened. This island in the sea of park which eventually became the airfield at Feltham has been reopened after its occupation during the war by the R.A.F. A week or two ago we announced the formation of a Blackburn-sponsored charter company, North Sea Air Transport, with a base at Hanworth, and this should combine well with the facilities now provided for visitors.

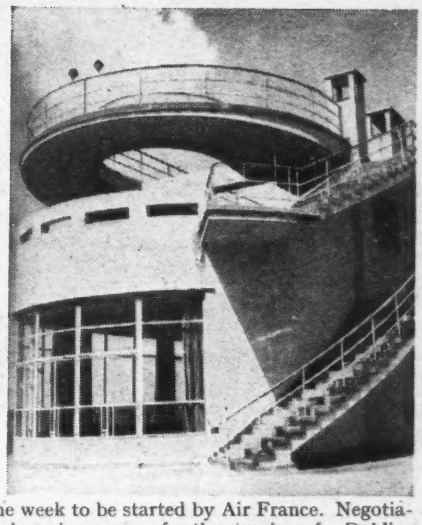
Ireland and Air Transport

Transatlantic Stepping-stones : Collinstown and Rineanna : Irish Development

ONE of the more remarkable features in the history of modern Ireland has been the position which this country has taken, partly because of her geographical position, in the world of air transport—and particularly in transatlantic service planning.

It is necessary to go back to 1936 to see the first real signs of civil aviation progress in Eire. During that year the operating company Aer Lingus, Tta, was established, and the first nationally run Irish Sea air service was started. In those days, however, the demands for air travel facilities were meagre, and it was not until the outbreak of war that this concern found that there were more potential passengers than were seats available. At that time, Aer Lingus had only three useful aircraft—two four-engined DH.86s, and one Douglas DC-2—and it was obviously impossible then to improve the fleet position. But the situation was put right as soon as possible after the war, when orders were placed for a number of DC-3s and, at the same time, surplus Dakotas were also purchased for conversion.

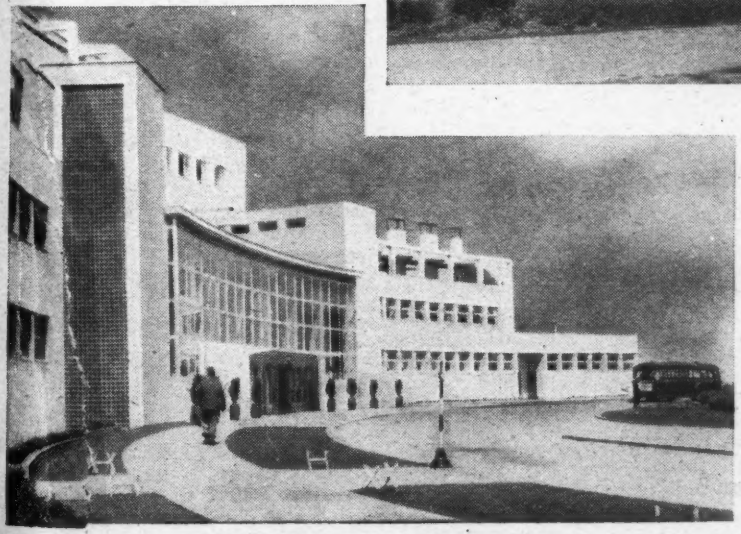
So far, Aer Lingus had confined its activities to cross-channel services and to a single internal link between Rineanna and Dublin, but quite recently the company has announced its intention of operating an Atlantic air service, though this will not, however, be in operation before next year. In the meantime, too, an extension of the company's network has been made by the opening of a twice-weekly service between Dublin and Paris, with a collaborative service on other suitable days of the week to be started by Air France. Negotiations have also been in progress for the opening of a Dublin-Stockholm route. Aer Lingus has a number of other plans for the linking of Ireland with the main Continental air centres.



The pleasantly arranged "public" section of the terminal building at Collinstown, Dublin.

Following the recent air agreement between the British and Eire Governments, the reconstructed Aer Rianta—which is the holding concern—became a joint company, with the B.E.A. Division of B.O.A.C. controlling 40 per cent of the shares, and Aer Lingus holding the balance. This arrangement was made so that there would be no overlapping of services or the appearance of wasteful competition in their separate operations.

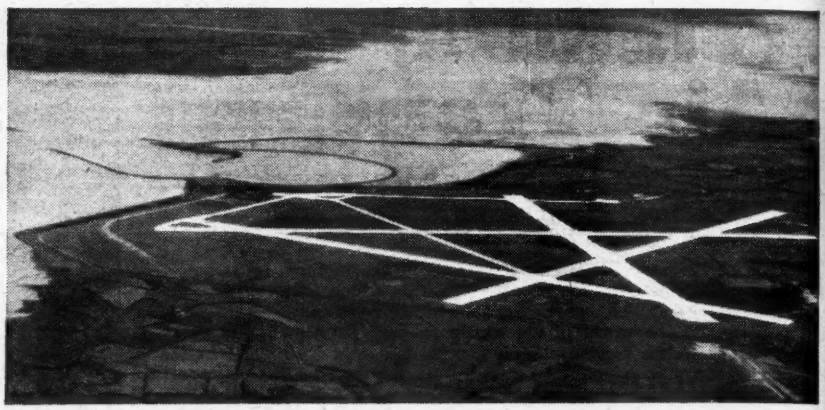
On the right is the main building and control tower at Shannon airport, Rineanna, work on which was started before the war. Below is a view of the Collinstown terminal block. The main building is curved in plan, with the outer radius facing the landing area.



At the moment the only internal service in Ireland is that between Collinstown and Rineanna, which is operated three times daily for the benefit of transatlantic travellers, but the question of internal air service expansion is one which must soon receive attention. The layout of a third civil airfield, in addition to Collinstown and Rineanna, has already been seriously suggested.

At the moment, Collinstown airfield, Dublin, though up-to-date as far as terminal buildings are concerned, is a grass field and is not quite big enough for modern types. Work, however, is

IRELAND AND AIR TRANSPORT



An aerial view of Shannon, showing the four runways and the flying boat base in the estuary on the south side of the airfield. An extension to the north-south runway can be seen in process of construction on the bottom right.

proceeding on the construction of runways, and these, it is expected, will be ready before the end of the year. The airfield at Rineanna, however, is, with its four runways, one of the better ones in Europe, yet scarcely more than a dozen years ago the area was a mere slobland on the western bank of the Shannon.

Both the B.O.A.C. and the Pan American Airways Atlantic services were very much in their infancy at the outbreak of war, and in those days Foynes was used as base, while the Shannon Airport was under construction. During the war Rineanna was occupied by a squadron of the Irish Air Corps, which maintained anti-submarine patrols around the coast. Nevertheless, the Irish Department of Industry and Commerce realized the likely future importance of the Shannon base, and, in spite of shortages of material and labour, continued to improve the facilities there. The value of the airfield became paramount when other American companies started to make crossings with DC-4s or, later, Constellations, and when P.A.A. substituted landplanes for the flying boats which had previously been used both by them and B.O.A.C. for their war-time services. Some idea of the standard of priority which was applied by the Irish Government to the constructional work at Rineanna can be gathered from the fact that a considerably increased cost in the contract for the extension of the terminal buildings, for instance, was accepted in order to effect a saving of some seven months in the time involved. The total cost, to date, of Shannon Airport has been in the region of £2,500,000.

Work at the airfield is still proceeding, and a temporary village is being built to house the workers, while negotiations have been in progress for the conversion of a local castle into an airport hotel. Curiously enough, work on another hotel at Foynes, planned when this was the terminal for trans-Atlantic services, is still going ahead. Though the reason for the continuance of this work is not quite clear, it is possible that this hotel may be used to provide further accommodation and so relieve the present congestion in Limerick. Foynes is, however, some thirty-five miles by road from Rineanna. Recently, the Eire Minister for Industry and Commerce announced the introduction, soon, of a Bill in the Dail, making Rineanna a "free port."

FOR THE BOOKSHELF

Are Officers Necessary? By J. Basil Boothroyd. George Allen and Unwin, Ltd. 5s.

INEVITABLY excellent though Mr. David Langdon's cover design for this book may be, one must admit that the casually interested prospective reader might, after examining this, form a somewhat incorrect opinion of the exact nature of the book. Mr. Langdon has portrayed a type somewhat special to the wartime Air Force—a self-conscious, somewhat cross and over-correct elderly junior officer, with a marked inferiority complex.

In fact, Mr. Boothroyd, in a series of unusually apt and amusing essays, has told something of the inner life of a somewhat differently constituted person. Furthermore, he has given a cynically true picture of Service procedure.

"All the Afternoon," and "All Right on Paper" provide probably the best of the sketches from the purely Service aspect, but a great many of the other essays, most of which have previously appeared in *Punch*, can be understood and appreciated equally well by those who have never had the misfortune to be caught in the toils of an Adjutant's Office or an Orderly Room. *Are Officers Necessary?* is, with one or two minor falls from humorist grace, extremely amusing in its own right and apart from its natural Service flavour.

H. A. T.

I Hold My Aim. By C. H. Keith, Group Captain, R.A.F. (Rtd.). George Allen and Unwin, Ltd. 10s 6d net.

A CERTAIN laxness in spelling and definitions fails to mar the interest of this account of armament development in the R.A.F.

"Gun cranks," whose numbers increased during the war (though the contrary is often held to be true), will devour with particular avidity the passages describing Continental hunts for weapons to replace the old Vickers and Lewis. Circumstances attending the acquisition of the 20mm Hispano are also recorded and it appears that news of this German/Swiss/French masterpiece (a King of Guns, as the author terms it) was first brought to the Air Ministry by Sqn. Ldr. Tom Harry England.

Referring to the unsuccessful power-driven Moesmer gun, a test model of which was made at the cost of many hundreds of pounds, Group Captain Keith writes that the inventor "had the cheek to offer us £50 for it." Rather than let him "peddle it in some other country and advertise our indiscretion," the gun, we read, was allowed to go to the scrap heap.

This being so the present writer would be interested to know how it found its way to a back street in Kennington, S.E., where he examined it during 1940.

H. F. K.

"The Post Office Went to War," by Ian Hay; H. M. Stationery Office, 1s 3d.

IN his preface to this nicely produced little booklet, Ian Hay says, "When, at the request of the Postmaster General, I set out to compile this little record of Post Office service during the years of war, I did so equipped with nothing beyond the profound ignorance and mild disfavour which distinguishes the majority of the British public in its attitude towards Government institutions. . . . I rise from my task a confirmed Post Office fan."

And it is not too much to say that those of the British public who read this account will also gain a new opinion of the Post Office, for the celebrated author has told what is essentially a dramatic story with a simple directness that allows the facts to speak for themselves. Like every other "service," the Post Office successfully pulled off many a "miracle" during the war years in spite of a depleted staff only partly replaced by untrained and inexperienced reinforcements, and this officially sponsored record of its achievements is a well-merited tribute to an oft maligned institution. Having read its 96 well-illustrated pages, we shall raise our hat to the local postman in future, and bide in humble patience when "trunks" keep us waiting.

N. D. R.

Civil Aviation Bill Goes Through :

CIVIL AVIATION NEWS

British Central American Service? Cutting Red Tape

COMMONS REJECTS LORDS' AMENDMENT

THE proposed House of Lords' amendment to the Civil Aviation Bill, creating a fourth Corporation to control Scottish services, caused more trouble than was expected when it was considered in the House of Commons. The Parliamentary Secretary asked that the House should disagree with the amendment, and in support of this he used some cogent arguments.

He pointed out that the plans already in the mind of the Minister were very extensive, and provided Scotland with a share of air transport in greater proportion to population than any other area. He said that he was at a loss to understand the reason for the Scottish desire to dissociate herself from the British European Airways Corporation, for more harm than good would be the result. The creation of a separate Scottish Corporation, with Scottish capital and limited to Scottish executives and personnel, would automatically create in British European Airways an English, Welsh and Northern Ireland Corporation, and if the argument was drawn to its logical conclusion Scotsmen would not be eligible for employment, nor would Scotland have any financial interest in B.E.A. Mr. Thomas commented that the proposed Scottish Corporation would be nothing more than a "stooge" of this Corporation.

The Opposition complained that Eire had been granted a majority share in a combined company, whereas Scotland, with its very close association with England, especially during the war years, was being deprived of any independent control whatsoever. In view of the status of Eire, this argument was not understood.

An important point was raised by Col. Hutchison for the Opposition, when he suggested that the Scottish Advisory Council should have a seat not only on the B.E.A. Corporation but also on B.O.A.C., for Scottish interests were confined not only to Europe. There was a continuous complaint from the Opposition that nothing whatsoever was mentioned in the terms of the Bill for the provision of the Scottish Division and Advisory Council, which had been only verbally promised by the Minister. The Lord President of the Council replied that the absence of such provision would allow the Minister far more scope for elasticity in the administration.

Mr. Morrison compared the terms of the amendment with the promises which had been made by the Minister—from which the conclusion was drawn that the only benefit to be derived from a separate Corporation would be the satisfying of Scottish national pride. As Sir Thomas Moore had already observed, Scottish sentiment was partly behind the amendment from the House of Lords; unless the strength of this sentiment was realized, due importance would not be given to the amendment. The amendment was rejected by the Commons in ratio of 227 to 104 votes, and the Bill was returned to the Lords.

On Wednesday of last week the Lords reconsidered the matter. As Lord Cranborne remarked, the issue was important, but not sufficiently so to invite a definite clash between the two Houses. The Lords carried the motion that this House did not insist on the amendment with which the Commons had disagreed.

OUR OWN MODIFICATION

B.O.A.C. have fitted one of their Constellation aircraft with the petrol injection system, and are now awaiting completion of the other modifications to try out this aircraft before it goes into service. The thirty or forty modifications which have been ordered by the American C.A.B. will probably take three or four weeks to complete. At the end of that time the Constellations will be put into full service on the trans-Atlantic route.

The findings of the enquiry into the crash in Pennsylvania have not yet been "promulgated," but it may be assumed from this latest announcement by the C.A.B. that the crash was not caused by engine trouble. It is understood that the modification to the pressurization system has not yet been completed, but it is the intention of B.O.A.C. to reopen the service without using this equipment.

IN THE WEST INDIES

THE institution of a four-year Canadian airline service between Montreal, Bermuda, the Bahamas, Jamaica and Trinidad, has been approved by the Bermudian legislative council. This is being opened as "a Commonwealth responsibility." Meanwhile, the Bahamas legislature has also approved a proposal resulting from the recent Anglo-American conference—that reciprocal flying rights should be waived for three years, as far as Canada is concerned, provided that a direct Canadian service is operated each year between Montreal and Nassau. The legislature has consequently approved the purchase of all equipment at Oakes airfield, which will subsequently become a civil terminal. This airfield was laid out during the war for training and Atlantic delivery flying.

BY HALTON TO CAIRO

FALKIRK, the first of the twelve Handley Page Halton aircraft ordered by B.O.A.C., left London Airport last Thursday on a proving flight to Cairo. Capt. W. G. Buchanan, one of B.O.A.C.'s million-mile pilots, is in charge of the aircraft, which will be calling at Algiers and Castel Benito. As announced in *Flight* two weeks ago, Haltons will be used on the West African, Cairo and Indian services, and B.O.A.C. expect the first service to Cairo to start before the end of this month.

LESS RED TAPE

THE total number of forms to be completed before a laden aircraft is permitted to take off has reached such dimensions that P.I.C.A.O. has made recommendations for a substantial reduction of these.

The proposal was immediately endorsed by the air lines through I.A.T.A., which has announced that active support will be forthcoming.

The present system of passports and vizas is complicated and cumbersome, whilst the manifest and loading returns for each flight require so much paper work that on one route alone it is known that the aircraft captain signs or initials exactly 527 documents for his aircraft and cargo.

Red tape is the direct cause of great losses in time and money, and P.I.C.A.O. will do well in seeking to remove these encumbrances to passengers and crews.

CIVIL AVIATION NEWS

COMMERCIAL HELICOPTER

HELICOPTER development in America has apparently reached the stage when a manufacturer can safely offer such a type for short-stage transport work. The Kellett Aircraft Corporation is at work on the prototype of a twin-engined 10-passenger version with an all-up weight of 11,600 lb. Two 550 h.p. Continental engines are used and the design has been based on the XR-10 helicopter now being completed for the U.S. Air Corps. The KH-2, as the new machine is designated, is of the synchronised twin-rotor type, utilising a rotor system which was developed in 1944 and used in the smaller XR-8.

INTERNATIONALIZATION

THE Secretary to the Ministry of Civil Aviation was asked in the House of Commons on July 31st to describe the approaches made to other countries regarding the establishment of an international organization to own and operate trunk services, and the results of such approaches. Mr. Thomas replied that practical effect had been given to the principle in the arrangements made following the Wellington conference for the creation of a joint Australia-New Zealand-U.K. Corporation for Pacific air services. He added that in the course of the P.I.C.A.O. discussions in Montreal last June it was made clear that the United Kingdom favoured the international operation of international air services. Lack of support, however, of these proposals made it impossible for further progress to be made at the present time.

CARIBBEAN POTENTIALITIES

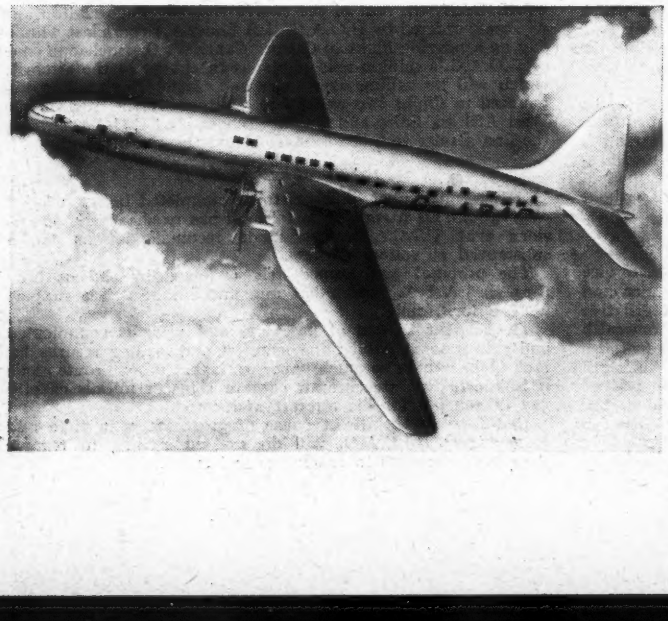
BRITISH South American Airways have just surveyed the possibilities of a direct air service to the Caribbean area. This area has, as yet, no direct air connection with the U.K., but, in the opinion of Air Vice-Marshal Bennett, the tourist and commercial demand would justify the inauguration of such a service.

Lancastrians would have to be used, so necessitating a landing in the Azores, for refuelling, before the first western stop in Bermuda. From there it is intended to run one service to Mexico, via Nassau and Havana, and the other to Lima, via Jamaica, Panama and the West Coast.

There are naturally some minor difficulties; for example, Mexico City is 7,500ft above sea level, making a take-off on the rather short runway a doubtful affair with a full load. As the intended next stage is only 800 miles, however, some petrol can be left off. Met. facilities are not very good south of Panama, but the weather on this route is normally good.

The main problem concerns the scattered nature of the area and the difficulty of giving adequate service both to the many islands for tourists and to the commercial centres, but there are already several local services which, it is hoped, will act as feeders to the main routes.

The frequency of this service will probably, for a start, be about once a week for each route, depending upon its popularity for any increase.



SPECIFICATION 2/44—alias the Bristol 167 or Brabazon I. An impression of the 285,000 lb. civil transport as it will appear when completed. The prototype, which is now reaching its final stages of development, will have four gear-box-combined "Double-Centaurus" 20s, while the Mark II will be powered with eight Proteus air-screw-turbines geared in a generally similar manner

MORE FUEL

AT the beginning of this month a small increase in the allowances of fuel for civil aviation was authorized by the Minister of Fuel and Power. The new allowances will provide a maximum of 75 hours a month for charter and taxi aircraft; of 60 hours for aircraft owned by flying clubs; and of no less than 6 hours for the privately owned aircraft! The previous figures were 60, 50 and 4 respectively.

CIVIL AIRCRAFT INCREASE

A GOOD indication of the development of civil flying in this country can be obtained from the Register of British Civil Aircraft published by the Air Registration Board. At the end of last year 248 certificated aircraft were being operated; of these 148 were large transport aircraft. By June 30th this year the total number had risen from 248 to 650, and of these 223 were transport machines. Of the remaining 427, however, 229 smaller types were exported.

The total weight of the registered aircraft at June 30th was almost eleven million lb—which gives an average of 16,900 lb for each aircraft. This makes an interesting comparison with the average weight per aircraft recorded in 1939—which was 2,200 lb.

IRISH AIRLINE STRATEGY

THE Minister for Industry and Commerce, Mr. Sean Lemass, disclosed sensible and realistic plans for the development of Irish Airlines in his speech to the Irish Senate, made during the passage of the new Air Navigation and Transport Bill. He made it evident that the Irish companies would be encouraged in creating a reputation for reliability and efficiency, and would not be hustled into making a financial profit.

The Minister said that the scarcity of equipment and many other technical problems must naturally hamper development at this stage. He felt confident, however, that as these problems were solved, then there was no reason why the services should not prove remunerative.

The touchy question of landing fees was also mentioned, and once again a bold approach was evident. Airports could be considered as being in the same category as roads, he said, and landing fees were a matter for international discussion. It would be possible to fix charges at a level which would almost completely recover the sums invested, whilst at the same time maintaining a sufficiently low level to encourage traffic and so facilitate development.

BRITISH GUIANA CHARTER

SOME time ago we gave a few incidental details of a charter service which had been operating in British Guiana since 1935. Flying from the mud flats of the Demerara River with Ireland Neptune amphibians—the only ones in existence—Major Art Williams and Harry Wendt, with their British Guiana Airways, have considerably helped to open up the country.

The concern now, we hear, has a permanent ramp and two hangars a mile or so from Georgetown, and are subsidised by the local Government for certain regular mail and passenger services to the interior. Towards the end of the war the company purchased a Grumman Goose to operate a shuttle service from Georgetown to Mackenzie field, some sixty miles away, and linking up with the British West Indies Airways service from Trinidad and Barbados. In order to assist them, Cdr. A. E. Worby—whose Naval Air Communication Squadron had been operating in the area during the war and was known, appropriately enough, as "Worby's Airlines"—was duly released from the Navy and ferried the Goose from Canada to Georgetown. The three pilots, Williams, Wendt and Worby, are now flying throughout the interior, into Dutch Guiana, and as far as the Brazilian and Venezuelan borders, while, more recently, Cdr. Worby has been making charter flights to other islands in the West Indies.

CIVIL AVIATION NEWS

POWER FOR THE BRISTOL 167

MORE than two months ago the Minister of Supply mentioned somewhat casually that the Brabazon I would eventually be powered by eight Bristol Proteus airscrew-turbines. This was, as we remarked at the time, the first public intimation of the fact that the Bristol Company had an airscrew-turbine project to follow the Theseus. The Proteus is expected to deliver an airscrew power of approximately 3,500 b.h.p., and eight of them will be installed in the 167's wing, giving a cruising speed of 350 m.p.h. at 35,000 ft or more. Incidentally, the Brabazon I's all-up weight figure, originally given as 110 tons, has now been more specifically detailed as 285,000 lb.

NORTH COUNTRY TERMINAL

MANCHESTER has always believed in the future of air travel, and we hear on good authority that the Corporation have plans for an up-to-date air terminus in the town. As a temporary measure, a prefabricated hut is to be erected on the site of the old Princes Theatre, and some pains are being taken to make this as comfortable and convenient as current restrictions allow.

The Manchester Airport, Ringway, has already made a post-war come-back and boasts three direct links of importance. In addition to the daily service between Belfast, Manchester and London, mentioned last week, the Isle of Man route has been reopened after a lapse of seven years, with a daily Rapide service to Ronaldsway. The North Country will welcome the convenience of the Manchester-Paris connection inaugurated by Air France on July 16th. Using DC-3s, the present time-table allows for three services a week.

BREVITIES

During the August week-end the airfield at Kingstown, Carlisle, was due to be reopened for civil purposes. Since August 5th there have been services between Kingstown and Ronaldsway, Isle of Man, and presumably the re-formed Border Flying Club will soon be making use of the airfield.

* * *

On July 15th Pan American World Airways started a daily through service between New York and Buenos Aires. Douglas DC-4s are used, and the elapsed time for the run is 38 hours.

* * *

Pilots for the Irish trans-Atlantic Constellation service are to be trained on the type in America. Capt. Paget McCormack, of Aer Lingus, is expecting delivery of the company's first Constellation in April next year.

* * *

Shannon has become an important airport-of-call for so many of the trans-Atlantic airlines that Lockheed are establishing there a service depot and spares distributing centre, under the supervision of Mr. Henry H. Ogden, who was well known in this country during the war.

* * *

Following the assumption of State control of air services in New Zealand, an air freight service has been inaugurated between the North and South Islands. Forwarding and distributing services by rail and road have been arranged to and from the air terminals.

* * *

B.O.A.C. announce frequency operated increases in two long-distance services. The York service to India is now operated five times weekly, and the flying-boat frequency to Australia has now been increased to three a week in each direction.

* * *

On July 31st, K.L.M. started a night freighter service between Croydon and Amsterdam. This service, on which a maximum of eight passengers may also be carried, operates twice nightly, and connects with other night services to Oslo, Copenhagen, Stockholm, and, for freight only, to Basle.

* * *

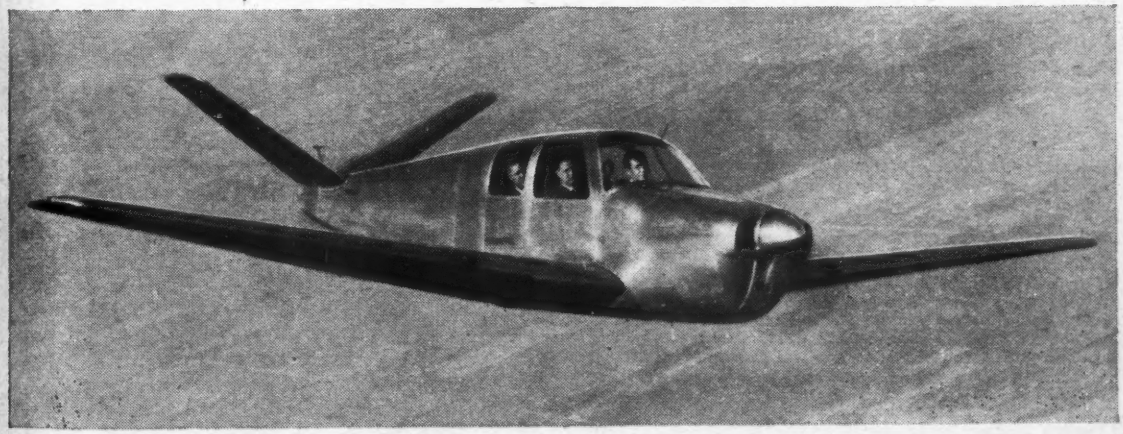
Melbourne's Essendon Airport is to be considerably modified and extended. A four-stage development plan has been announced which includes the construction of a 2,000 yd east-west runway for instrument arrivals. If and when aircraft movements exceed five hundred a day, the planned number of four runways will be increased to eight. The building arrangements are being laid out on the decentralized lines, each airline company having its own building group.

* * *

The negotiations between Australia and the U.S.A. for reciprocal landing rights on the Pacific service have not yet been finalized, and the A.N.A. service as well as the Pan American extension from Auckland to Sydney have been held up. The main stumbling block is believed to be the American retention of an air traffic monopoly between Hawaii and the U.S., but passenger and freight rate agreements provide another problem.

* * *

On Thursday of last week Scottish Airways started an augmented air service between Glasgow, Inverness and Kirkwall. This is in addition to the existing service to Kirkwall and Sumburgh, in the Shetlands.



THE LATEST BEECHCRAFT : Superficially unusual—at least because of the fact that it has a vee-tail and dispenses with a rudder—the new Beechcraft Bonanza also has quite a remarkable performance. With a Continental flat six of only 165 h.p., it has a maximum speed of 184 m.p.h., while carrying four 170-lb. people and 100 lb. of baggage ; the maximum cruising range, at 165 m.p.h., is 750 miles. The control layout is normal, the elevators performing the function also of rudders. This particular tail design was developed during tests with a Beechcraft AT 10. The Bonanza has a tricycle undercarriage arranged so that, when the aircraft is on the ground, the wing has quite a considerable angle of attack, thus permitting a natural fly-off.

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

JET BOMBERS

XB-43 Not an Adaptation ?

IN your issue of July 18th, under a photograph of the Douglas XB-43, there is a caption which reads, in part, as follows: "The new Douglas, interesting and ingenious as it is, is an adaptation of a piston-engine machine."

I do not believe that this statement is correct, and is perhaps unfair to our American friends, inasmuch as it suggests that the XB-43 was not originally designed for jet engines and that they were fitted as an afterthought.

So far as I know, this was not the case and this machine was always to be powered by jets, but possibly because of their unavailability, it was decided to build the XB-42 first as a piston-engined prototype.

Without knowing anything about the manufacturers' development programme, it would certainly seem quite logical to try out such things as wings, undercarriage, flaps, cockpit hoods, etc., all of which were new, on such a prototype—even if the drive to and position of the airscrews was unorthodox.

Having thus obtained experience on the airframe and, incidentally, many valuable data on the efficiency and working of this type of pusher airscrew, the fitting of the jets was the contemplated final step. It would, therefore, be fairer to say that the XB-42 was an adaptation of the jet-engined XB-43, rather than the other way round, and whilst I stand to be corrected by the Americans on this point, I do not think it is fair to let your caption pass without comment.

New York. CHRISTOPHER CLARKSON.

[The author of the article replies:— "We must differ from Mr. Clarkson and cite in our support information from the manufacturers of the aircraft concerned. An extract from *Douglas Airview* proves that the XB-42 was no mere 'piston-engined prototype'; this reads: 'XB-42 first bomber in the 400-m.p.h. class and a hitherto undercover weapon upon which the nation would have relied had the war been prolonged'

"The type was, in fact, to be an American counterpart of the Mosquito, though carrying double the bomb load, and was ready for production when the war ended, having been on test for two years. Incidentally, it was certainly *not* 'first bomber in the 400-m.p.h. class,' the Mosquito having already claimed this honour, but it did embody some interesting features preserved in the XB-43.

"Like Mr. Clarkson, we have not seen the manufacturer's development programme, but we *do* remember seeing a copy of the original specification of the XB-42 at a time when the XB-43 could hardly have been under serious consideration."]

THE DITCHED WAYFARER

No Navigating Officer on Board

IN your publication of July 18th, you mentioned in "The Outlook," the unfortunate ditching of the Wayfarer due to navigational reasons.

Would it not be fair to the professional navigators to mention, also, that no actual navigating officer was carried on the aircraft? W. M. C. H.

P 51-F LIGHTWEIGHT MUSTANG

Why Earlier Models Were So Much Heavier

REFERRING to the article on the above on page 613 in *Flight* of June 10th last, it may be of interest to other readers to know something of what led up to the remarkable weight reduction in this Mustang development.

Shortly after the first of the early P.51s were put into active service, it became apparent that the machine was handicapped by greater weight when compared with contemporary aircraft in the same category. The authorities demanded of the firm an explanation of the fact that the Spitfire IX, a very close equivalent, was more than 1,000lb lighter, though able to stand up quite satisfactorily to front-line service.

In their thorough American fashion, the North American engineers obtained three Mark IX Spitfires, using one for flight and wind-tunnel tests, taking another apart for a very detailed weight analysis, and cutting the third up into little pieces for material strength tests! A very detailed report was prepared, comparing the component and group weights of the P.51 and the Spitfire, and accounting as far as possible for the discrepancies.

When due allowance had been made for the greater weight of certain items which we would call "embodiment loan parts," such as engine, armament and airscrew, and for higher design factors where applicable (notably in the chassis), it was found that some 500lb remained unaccounted for. This, it was found, was distributed over the whole structure and fittings, representing the effect of designing Mustang details primarily for ease of production, and Spitfire details for minimum weight.

In this respect the two machines may be said to represent something approaching opposite extremes, performance being practically the only criterion in the case of the basic design of the Spitfire, and production man-hours the primary consideration in the case of the original Mustang—each at the expense of the other. The interesting thing is the staggering effect on the weight of the machine—over 7 per cent—arising from a different point of view of the detail draughtsmen and designers, and I think we would do well to avoid going the whole hog on "productionizing," towards which there is a strong tendency now.

It is generally conceded that the Spitfire was rather too much of a "hand-made" aircraft for quantity production, so it would seem that the best compromise lies somewhere between these two extremes.

To some extent we can have our cake *and* eat it in this problem, for as the detail designers' knowledge of ease-of-production requirements has been steadily increasing during the war, it becomes possible in many cases to fulfil both requirements simultaneously, where only one was considered before. "STRESSMAN."

TRIBUTE TO "JOE ERK"

His Work Inspired Confidence

MAY I add my thanks to "Joe Erk"? I think it's about time we aircrew types woke up and thanked the ones that helped us through our "ops." As most aircrews will agree, it gave a certain amount of confidence to know the aircraft was in good serviceable condition.

Special thanks should be handed out to the "Joe Erks" in the R. and S. Hangars. To see your kite shut up and with an engine U/S, and next morning go and see it fully serviceable in its dispersal, is to appreciate a big job done well.

Have you seen "Joe Erk" refuelling on an iced mainplane, seen him working on the engines and fuselage on a very cold day and thought to yourself "How does he do it?"

Joe had a good temper; he had to have, to take some of the remarks given to him by the aircrew, and getting blamed for things that a particular member of the crew did. He said nothing and got on with his job.

I would like to thank members of my ground crews of A-Able, 57 Squadron, and R-Roger of 7 Squadron. Thanks, chaps; you were "bang on."

I would like to quote an instance that has happened on most squadrons. We lost an engine and we had it replaced by a new one. That night we were "on" again, and when the time came to do our air test, we found her U/S. My three "mechs" worked on that engine all the lunch-time, had no dinner, and through tea-time, just so that we would not take any other aircraft but our own.

So I thank you, Joe, once again for doing such a grand job and for getting us types through our "ops." I hope you get a better deal in Civvy Street. F. E. YOUNG (Flight Eng.).

COST OF FLYING

What Are the Owner-Pilot's Expenses ?

I HAVE never seen figures published of the cost of operating a private aircraft. I should be very interested to see readers' experiences, if possible, divided amongst the various standing and flying charges, also the cost of the annual C. of A.

These might also be divided under the various classes of private aircraft as follows: 1, very light aircraft such as the Aeronca, Tipsy, etc.; 2, light aircraft such as the Swallow, Auster, etc.; 3, faster aircraft such as the B.A. Eagle, etc.; 4, larger aircraft such as the Percival Proctor, etc. J. H. R.

Reducing Aircraft Losses

Maclaren Anti-strike Coolant Protection System : Automatic Isolation of Damaged Sections

AMONG the many developments about which little or nothing was told during the war period, one of the more interesting was a system for automatic anti-strike coolant protection in aircraft. The experimental and production work on Mr. O. F. Maclaren's original layout was completed by his firm at Heston, and only the difficulties involved in the quantity production of the various items, and in their installation without disturbing the normal flow of aircraft manufacture, prevented the system from being more extensively used. Mr. Maclaren will be remembered as the designer of a "steerable" undercarriage system which permitted drift landings and was successfully applied on test to various types, including the Oxford and the Mustang.

It is undoubtedly true that by far the greatest proportion of aircraft losses during the war were the result not so much of personal casualties in combat or from anti-aircraft fire, but of forced landings following damage to coolant systems. As far as single-engined fighters are concerned, it has been impossible to obtain reliable figures, since the resultant damage nearly always prevented the aircraft from returning to base, and no records could consequently be compiled. But a number of figures were obtained for damage to multi-engined aircraft—and, in particular, for that suffered by Mosquitoes. It was found, for instance, that in twenty-eight cases of strike damage, fourteen of these involved complete or partial loss of coolant from the system actually outside the engine nacelle itself.

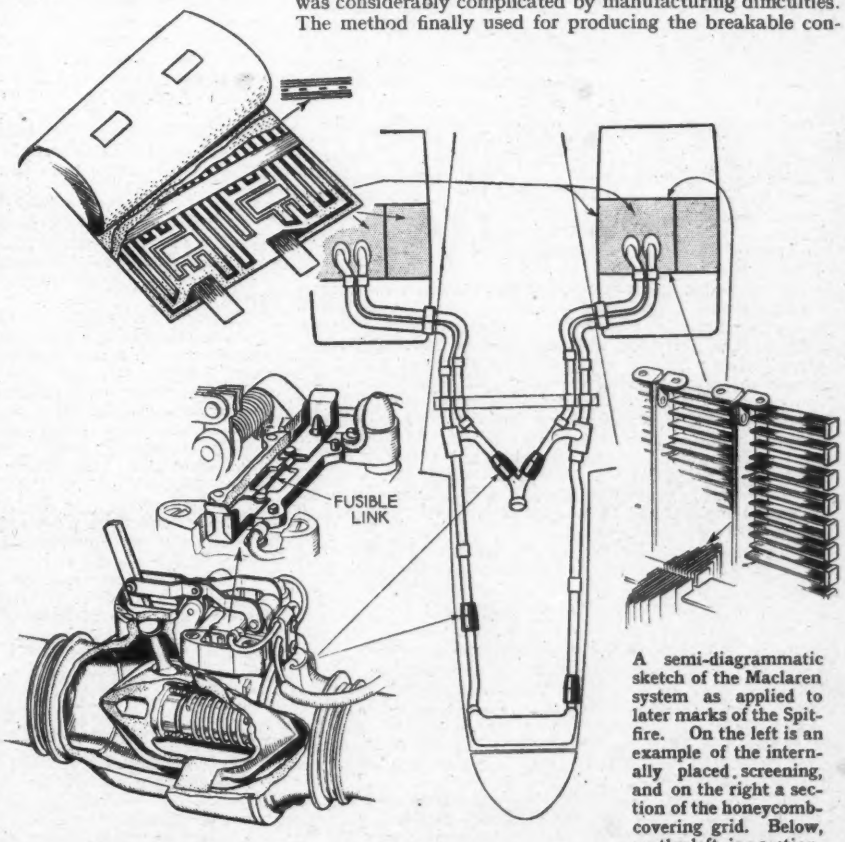
The degree of importance attached to such coolant protective measures is indicated by an extract from Air Publication 970, which, amended early this year, reads: "On single-engined aeroplanes a device shall be incorporated to ensure that, in the event of a single strike in the radiator, at least sufficient coolant will be retained in circulation to enable the aeroplane to continue in straight and level flight." It does not require a great deal of imagination to realize that a similar system can be applied with equal value to items such as lubrication circuits, and might even be developed for other types of military aircraft power unit.

Simple Principle

In principle the Maclaren system is quite simple. When a strike is suffered in or near a radiator, that part of the coolant system is instantaneously isolated, thus preventing loss of glycol and engine failure. Naturally enough, the system can only be applied successfully in cases where two separate radiators are fitted—but this is the rule rather than the exception in fighter design. The surfaces of the radiator sections are enclosed in screens consisting, in effect, of wire circuits, connected in series and carrying a small electric current. If a bullet, shell or shell-splinter pierces the area, it must necessarily pass through one of the screens, and thus break the circuit. This breakage causes a solenoid to operate which, in turn, closes a full-power circuit. This "blows" high tensile steel fusible links. A trigger mechanism then allows the closing of each of the spring-loaded valves in the coolant system.

Simple as the principle may be, the detail design work and the organization of comparatively easy methods of manufacture of the various parts involved the exercise of considerable ingenuity. The "contact areas" are of two kinds. The internally placed screens must, of course, be of sufficiently thin section to be capable of installation between the radiator block and the enclosing fairing, and to be fully insulated. Those in front of, and behind the honeycomb itself must, additionally, permit free passage of air and be robust enough to be resistant to the impact of stones thrown up while taxying and taking off.

Whereas the construction of the steel grids is a comparatively straightforward affair, apart from the very critical tempering of the steel ribbons, that of the screens was considerably complicated by manufacturing difficulties. The method finally used for producing the breakable con-



A semi-diagrammatic sketch of the Maclaren system as applied to later marks of the Spitfire. On the left is an example of the internally placed screening, and on the right a section of the honeycomb-covering grid. Below, on the left, is a sectioned view of the automatic valve and its fusible link; notice how the "snap" valve and its fixed fairing normally form a streamline shape in the coolant pipeline.

REDUCING AIRCRAFT LOSSES

ducting strips which lie between thin sheets of insulation is similar to that employed in line blockmaking. The copper screen is, in fact, deposited by electrolytic methods on a suitable "stencil." These thin copper grids are then moulded under pressure between bakelized linen sheets.

The design of the coolant valves, two of which are incorporated in each radiator circuit, involved the need for further ingenuity. These had to be compact enough to be incorporated with negligible modification to the pipelines, and, at the same time, had to be designed so that there was minimum resistance to normal coolant flow. Furthermore, the fusing release mechanism had necessarily to be reliable, both in action and inaction. Vibration tests were made to ensure that in no conditions could the fusing link "jump" and thus accidentally close the valve. This last is spring-loaded under considerable tension so that it will snap shut when the link is fused. It is of the taper-seating type, providing, when open, a streamlined internal shape. The accompanying sketch shows the way in which the valve is held through two parallel links and a stirrup with the operating lever working, of course, in a water-tight gland. The body of the valve is an aluminium casting, machined internally, and the non-operating streamline "tail" of the valve is held in a spider.

The use of solenoids rather than of any direct-action circuit breakage is necessary, in the first place, to reduce the pre-emergency current consumption; in the second place, to ensure an adequate current for fusing; and, in the third place, to prevent premature operation of the cut-out valves when and if the battery voltage drops. In the original version of the Maclaren system, the operating current was, so to speak, in the circuit when the gun-sight was switched on. In production form, however, it was decided that no such preliminary action should be required, and, as far as the pilot is concerned, the only evidence of the presence of the equipment lies in the use of indicator lights—to indicate the fact that one or other of the radiators had been put out of circuit, thus warning him to use lower boosts and to make for base.

The total weight of the equipment, as applied to any mark of Spitfire, is 25 lb, and a similar installation to protect the lubrication circuit weighs only 8 lb.

"GAS TURBINES"—FOURTH EDITION

"Gas Turbines and Jet Propulsion for Aircraft," by G. Geoffrey Smith, M.B.E., Editorial Director of "Flight" and "Aircraft Production." Foreword by Sir Geoffrey de Havilland, C.B.E., F.R.Ae.S. Fourth Edition. "Flight" Publishing Co., Ltd. 12s 6d net.

IN an introductory note to this important new edition of what has become the standard work on jet propulsion, the author throws some interesting light on the circumstances under which the book was first compiled. Early in 1941 he discussed with Lord Brabazon, then Minister of Aircraft Production, the desirability of reviewing progress with turbine-jet propulsion, having regard to the fact that engineers of several countries were carrying out experiments with power units bordering upon the practical stage. There was no technical book on the subject, but a great deal of material in the form of items gathered from various Continental sources. Lord Brabazon agreed that the publication of a handbook would be a useful service to the British engineering world, though at that time, of course, nothing could be revealed of British activities.

Since the publication of the first edition in 1942, two further enlarged editions have been distributed throughout the world. The fourth edition, now available, represents a very great advance not only in scope and completeness (a mass of new material having become available since the war) but in the explanation of basic principles. Thus, in the initial chapter the working of the jet propulsion unit is described with the aid of diagrams, and a variety of systems explained. The comparison of rotating and reciprocating power units will prove of particular value to those who have not yet grasped the underlying principles of "rotary power." Equally valuable is a list of twenty-one advantages of turbine units, compared with piston engines, and an analysis of factors affecting thrust and performance.

A chapter on early projects reveals amazing foresight on the part of pioneers, and gives due credit to the Italian investigations.

Design and Metallurgy

Turbine and compressor design, combustion systems, fuel equipment and controls are described and abundantly illustrated, and it is made clear in a new chapter dealing with metallurgy that the development of new materials will continue to be of prime importance.

The demand for previous editions was such that the work has been out of print for several months. In the fourth enlarged edition published to-day there are 246 pages and more than 200 illustrations.

Students of design are amply catered for in chapters describing British, American and German gas turbines, the salient features of which are set out in tabular form. It is apparent that interest in the axial-flow unit is by no means confined to Germany and America, and the promising Metropolitan-Vickers units are described alongside the radial-flow de Havilland and Rolls-Royce designs, now well established. The Armstrong-Siddeley Python and Bristol Theseus airscrew-turbine units are notable additions to the British range.

The maintenance of gas turbines and their testing, both in the air and on the ground, are the subject of a special study, and the author gives an account of the unique B.M.W. high-altitude test plant at Oberweisenfeld, in Austria, which he visited on his tour of German gas-turbine establishments.

Having recognized the close relationship between the gas turbine unit and the airframe for which it is intended, a chapter has been added on current types of turbine-propelled aircraft, quoting specifications of some of the latest jet types, including the Gloster Meteor and D.H. Vampire, and several American prototype fighters. A photograph is included to show the intake arrangements on the Douglas XB-43, the first jet-propelled bomber to be flown since the war.

Jet versus Airscrew

Consideration is given to the respective merits and shortcomings of the jet and airscrew, and the reader is acquainted with the possibilities of thrust augmentors which may have some part to play in the development of medium-speed aircraft.

Closely allied to the development of jet aircraft are the problems of compressibility and boundary layer control which are summarized prior to a discussion of tailless aircraft and flying-wing designs.

Closed-cycle systems and steam turbines are described within the limits of available knowledge, and a welcome chapter has been added to cover the applications of jet propulsion to guided missiles and flying bombs. Here the author briefly describes his proposal for a long-range weapon, using rocket and athodyd propulsion, submitted to the Department of Scientific Research in October, 1943.

The careers of Air Commodore Whittle, Mr. W. G. Carter, and other personalities identified with the development of jet propulsion in Great Britain, are briefly surveyed, and the views of prominent authorities are summarized from published papers. Air Comdre. Whittle contributes a most interesting note of his views of possible future development. Of a less technical nature are descriptions and observations extracted by the author from radio talks he has delivered on a subject, the importance of which he appreciated when many failed to recognize its significance and expressed open scepticism.

AN AIRCRAFT ALBUM

AS "an enduring record of some part of the British aircraft industry's contribution to victory and of its brighter promise for air transport in peace," the Society of British Aircraft Constructors has issued, in the form of an album, a series of paintings and drawings of British aircraft. The pictures are the work of Wootton, Cuneo and Roy Nockolds.

The merit of these artists has been the subject of much discussion. In our view Wootton has achieved the greatest success.

SERVICE AVIATION

BY TYPHOON, OUT OF TEMPEST : The exceptional aerodynamic cleanness of the Hawker Fury I prototype with Napier Sabre VII engine is shown to particular advantage in this new front view. With methanol-water injection the top speed is estimated to be about 485 m.p.h.

Royal Air Force and Naval Air Arm News and Announcements

Naval Air Arm

REAR-ADMIRAL A. R. M. BRIDGE, C.B.E., has been appointed Rear-Admiral aircraft carriers and air stations, British Pacific Fleet and East Indies, in succession to Rear-Admiral C. H. L. Woodhouse, C.B.

Rear-Admiral Bridge was in close touch with naval aviation throughout the war. As a Captain he commanded the carrier *Eagle* in the Mediterranean at a time when enemy attacks on our shipping in that area were at their height. The excellent results of the attack by Swordfishes on the Italian Fleet at Taranto in 1941 won him the C.B.E.

In the later stages of the war Rear-Admiral Bridge held a number of shore appointments. Last December he was appointed Flag Officer commanding carriers and air stations, East Indies.

No. 19 S.P. Disbanded

NO. 19 Staging Post, the first R.A.F. unit to function in Berlin, was officially disbanded last month.

The unit, then known as No. 91 Forward Staging Post, landed in Normandy soon after D-Day, where it operated an emergency landing strip, handling up to a hundred aircraft a day.

The unit was later sent back to England for three and a half months to reform. It returned to the Continent in March, 1945, and at Evere airport, Brussels, prepared for the work of handling all the air traffic for the Potsdam Conference.

On June 29th, 1945, the advance party of No. 19 Staging Post moved into Berlin, where it set up several records in the speedy handling of "V.I.P.s" and cargo. As is the case with other staging posts now disbanded, the work of No. 19 S.P. is being carried out by the R.A.F. Station on which it was located, namely Gatow.

Air Traffic Film

ONE of Transport Command's personnel problems is the fact that former operational aircrews transferred to ground jobs in the Command tend, naturally enough, to find their work uninteresting.

As part of the effort to "glamourize" some of the ground tasks, the Air Ministry and No. 1 Air Traffic School have combined to produce a film, "Traffic Officer," in which an all-R.A.F. cast demonstrates to prospective traffic-officers and air movement assistants how greatly the swift handling of passengers, mail, and freight depends on their efficiency.

The film includes sequences made on one of the main Middle East airfields.

Appointment

AIR VICE-MARSHAL C. W. WEEDON, C.B., C.B.E., to be A.O.C. No. 41 Group, Maintenance Command.

Awards

THE KING has been graciously pleased to approve the following awards:—

O.B.E. (Mil.)

Wng. Cdr. J. R. KAYLL, D.S.O., D.F.C., A.A.F., No. 54 Sqn.
Sqn. Ldr G. D. CRAIG, A.A.F., No. 607 Sqn.

M.B.E. (Mil.)

Flt. Lt. N. E. CANTON, D.F.C. R.A.F., No. 140 Sqn.
Flt. Lt. C. MARSHALL, R.A.F., No. 49 Sqn.
Flt. Lt. R. G. KER-RAMSAY, R.A.F., F.I.V., Shoreham.
Flt. Lt. E. H. L. SHORE, R.A.F.V.R., No. 501 Sqn.
W/O. H. NORTHROP, R.A.F.
W/O. K. R. OOLES, R.A.F.V.R., No. 139 Sqn.
W/O. S. R. CROFT, R.A.F.V.R., No. 500 Sqn.
W/O. S. L. HARRISON, R.A.F., No. 12 Sqn.
W/O. G. M. HYDE, R.N.Z.A.F., No. 218 Sqd.
W/O. T. T. S. LARSEN, R.N.Z.A.F., No. 150 Sqn.
Flt. Lt. A. M. CRAWLEY, A.A.F., No. 73 Sqn.
F/O. G. C. RILEY, R.C.A.F., No. 428 Sqn.
W/O. K. GRALEY, R.A.F., No. 104 Sqn.

Distinguished Flying Cross

Flt. Lt. O. N. DIAMOND, R.A.A.F., No. 1 (R.A.A.F.) Sqn.
Flt. Lt. J. K. DOUGLAS, R.A.A.F., No. 1 (R.A.A.F.) Sqn.
Flt. Lt. D. M. PAYNE, R.C.A.F., No. 428 Sqn.
F/O. G. S. MERCER, R.A.F.V.R., No 81 Sqn.
P/O. K. H. R. JONES, R.A.F.V.R., No. 81 Sqn.

Roll of Honour

Casualty Communiqué No. 596.

The Air Ministry regrets to announce the following casualties on varjous dates. The next of kin have been informed. Casualties "in action" are due to flying operations against the enemy; "on active service" includes ground casualties due to enemy action, non-operational flying casualties, fatal accidents and natural deaths.

Of the names in this list 99 are second entries giving later information of casualties published in earlier lists.

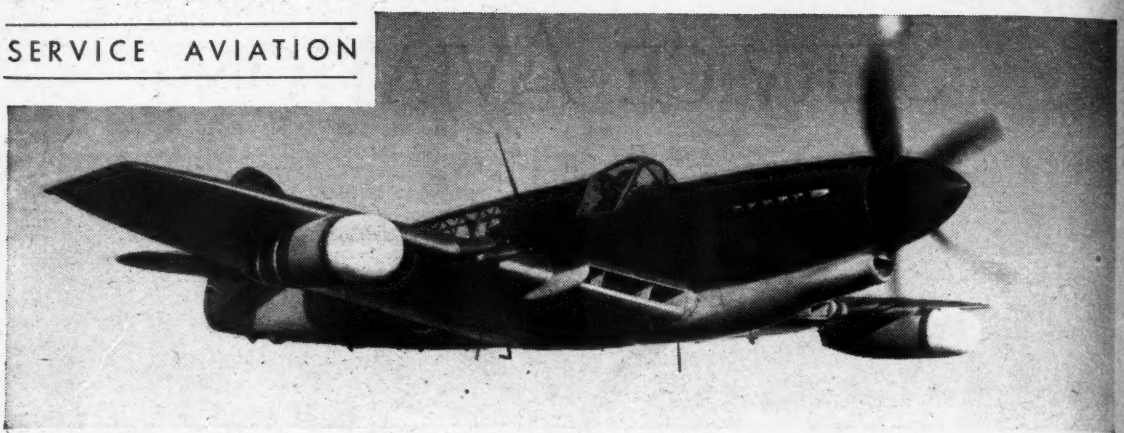
Royal Air Force

KILLED IN ACTION.—Flt. Lt. T. A. Andrews; Act. Sqn. Ldr. B. G. Slip.

MISSING, BELIEVED KILLED IN ACTION, NOW PRESUMED KILLED IN ACTION.—F/O. P. W. Crawshay-Fry.

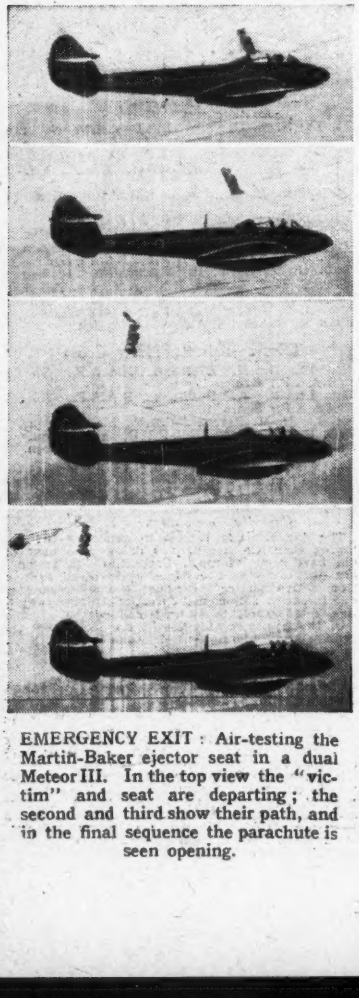
PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—F/O. T. S. Akenhead; F/O. R. Appleyard, D.F.M.; Flt. Sgt. L. G. Baldock; Sgt. M. J. F. Baldwin; Flt. Lt. N. C. Berrisford, D.F.C.; Flt. Sgt. J. C. Bevan; Flt. Sgt. A. E. Bull; F/O. F. L. Burton; F/O. H. N. Catt; Sgt. H. Chadwick; Act. Flt. Lt. H. Chapman; Flt. Sgt. L. D. I. Coates; Flt. Sgt. D. J. Critch-

SERVICE AVIATION



DECKED FOR DUTY: The outboard fairing beneath the starboard wing of the Fairey Firefly IV Naval reconnaissance-fighter houses radar gear; the corresponding port excrescence is a tank. Inboard are four Mark V 20 mm. guns and provision for bombs or R. P.s. A Rolls-Royce Griffon 74 gives a top speed of 386 m.p.h. at 14,000ft.

ley; F/O. K. N. J. Croft; Flt. Sgt. T. J. Crossman; W/O. S. B. Currie; P/O. R. E. Davenport; Flt. Sgt. R. E. Davies; Sgt. F. A. Edwards; Act. Sqn. Ldr. C. D. Erasmus, D.F.C.; Flt Sgt. F. Fearnley; Flt. Sgt. T. J. A. Grant; Sgt. T. Hendry; Sgt. R. Hetherington; Sgt. P. Hogan; Flt. Sgt. D. Hollinrake; Flt. Sgt. A. E. S. Holt; F/O. H. S. Johnson; F/O. P. W. Kennedy; Sgt. G. Kernohan; Flt. Sgt. G. A. Lee; Flt. Sgt. C. McBurney; F/O. P. McCartney, D.F.C.; F/O. P. Millhouse; Flt. Sgt. H. L. Morgan; Sgt. N. E. Mullins; Flt. Sgt. K. F Newman; Sgt. M. Ogilvie; Sgt. P. P. Olson; Sgt. W. G. J. Price; Sgt. K. G. Prichard; Flt. Sgt. J. S. Ratcliffe; Flt. Sgt. G. Robinson; Flt. Lt. S. O. Searles, D.F.C.; Sgt. D. H. Sheppard; Flt. Sgt. J. E. Short; Sgt. P. E. Simons; Sgt. D. Spowart; Sgt. H. W. Tasker; Sgt. B. J. Watts; Sgt. D. Wilson; Sgt. K. Woodburn; P/O. G. C. R. Woodhouse; F/O. S. C. York.



EMERGENCY EXIT: Air-testing the Martin-Baker ejector seat in a dual Meteor III. In the top view the "victim" and seat are departing; the second and third show their path, and in the final sequence the parachute is seen opening.

PREVIOUSLY REPORTED MISSING, NOW REPORTED KILLED IN ACTION.—Flt. Sgt. G. R. Leigh.

MISSING.—P/O. J. E. Adam; L.A/C. J. L. Dawes; Flt. Lt. G. H. Jones, D.F.C.; Act. Wing Cdr. W. E. M. Lowry D.F.C.; Flt. Lt. E. C. L. Nichols, A.F.C.

KILLED ON ACTIVE SERVICE.—Flt. Lt. B. D. Baker, D.F.C.; Flt. Sgt. F. Blakey; W/O. D. O. Bradburn; Sgt. P. Cobb; F/O. S. I. Davies; Flt. Lt. G. A. B. Edwards; F/O. W. F. V. Forde; F/O. S. Garside; Flt. Lt. G. Godden; L.A/C. C. J. Greenstone; Sgt. A. E. Headland; A/C.2 W. A. Heard; Flt. Lt. H. J. Marley; F/O. R. G. Marshall; F/O. G. J. Myers; F/O. L. Richardson; F/O. J. B. Sant; F/O. J. O. Searle, D.F.M.; Flt. Sgt. P. Sinnett; Wing Cdr. R. D. Speare, D.S.O., D.F.C.; F/O. C. P. Thomas; L.A/C. R. J. Tibbetts; Flt. Lt. A. P. B. Watson.

MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—F/O. J. Craig; Flt. Sgt. T. N. Gallagher; Flt. Sgt. P. H. Hall; Flt. Sgt. E. H. Hartrey; Flt. Sgt. D. H. Pomeroy; W/O. R. E. Twomey.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Sgt. A. A. F. Morris; L.A/C. R. Napier.

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED ON ACTIVE SERVICE.—P/O. T. G. D. Ashley-Cooper; F/O. R. A. A Cannon; Flt. Lt. T. J. D. Cook.

WOUNDED OR INJURED ON ACTIVE SERVICE.—A/C.2 B. B. Turner.

DIED OF WOUNDS OR INJURIES RECEIVED ON ACTIVE SERVICE.—W/O. D. Kemp.

PREVIOUSLY REPORTED MISSING, NOW REPORTED DIED ON ACTIVE SERVICE.—F/O. J. W. Methley.

DIED ON ACTIVE SERVICE.—A/C.2 A. H. Alcock; A/C.1 A. A. S. Almeroth; L.A/C. N. M. Anderson; A/C.2 N Arthur; L.A/C. G. A. Attew; A/C.1 G. Bailey; Cpl. K. G. Benson; A/C.1 J. O. Berry; W/O. F. S. Biggs; L.A/C. J. Black; Cpl. A. C. Blanchard; L.A/C. R. A. Bowden; Sgt. R. A. J. Bradford; L.A/C. J. Brown; A/C.2 L. Brown; A/C.1 R. M. Brown; L.A/C. T. R. Bruce; A/C.1 W. G. Butt; L.A/C. B. Byron; A/C.2 D. Camberg; L.A/C. P. J. Carter; Cpl. R. C. Carter; A/C.2 S. Chaplin; Cpl. R. E. Clark; Cpl. J. Clayton; L.A/C. S. I. Cleves; A/C.1 A. E. Collins; A/C.1 L. H. Cooper; A/C.2 A. R. Copeland; F/O. S. W. Cressey; A/C.1 J. K. Crone; A/C.1 A. J. Croot; L.A/C. T. Cunningham; A/C.1 D. M. Cuthbertson; A/C.1 D. H. Davies; A/C.1 G J. W. Davies; L.A/C. L. Davies; A/C.2 S. T. Davies; A/C.1 W. J. De Garis; L.A/C. G. A. Devonport; L.A/C. D R J. E. Dimmick; Sgt. K. L. Dodds; A/C.1 A. Dumbleton; A/C.1 R. Duncan; Cpl. R. J. Durrant; A/C.2 L. C. Dye; Flt. Sgt. S. F. Easthaugh; A/C.1 R. C. Eccleshall; L.A/C. S. V. Edden; A/C.1 E. A. S Edwards; A/C.2 W. L. Edwards; A/C.1 A. H. Elder; L.A/C. W. A. R. Eyles; L.A/C. T. J. Farrell; L.A/C. J. B. Finlay; A/C.2 S. N. Fletcher; L.A/C. A. W. Francis; A/C.2 H L. Frew; A/C.2 K. E. Frost; A/C.1 A. F. Gale; Cpl. J. R. Garriock; Sgt. W. C. Gent; Cpl. D. A. L. Gibbons; A/C.1 C. F. Gibbs; A/C 1 G. R. Gilchrist; A/C.1 A. G. Godlonton; L.A/C. C. E Gossey; L.A/C. R. W. Graham; Cpl. S. H. Graham; A/C.1 H. P. Granger; A/C.2 H. N. Greeves; L.A/C. J. H. Grimley; L.A/C. J. M. Groake; Cpl. W. R. W. Groves; Sgt. D A. Guest; L.A/C. K. J Haddock; Cpl. J. Harrington; A/C.2 H. Harrison; Cpl. H. Harrison; Cpl. J. Hart; L.A/C. W. G. Hatcher; A/C.1 A L. Hill; A/C.1 J. R. L. Hillam; Cpl. J. F. Hind; Cpl. F. W. Hobbs; Cpl. W. G. Hood; L.A/C. D. Hopkins; L.A/C. R. W. Howe; A/C 1 W. G. Humphries; A/C.2 W. R Hurson; L.A/C. S. Hutchinson; Cpl. H. T. A. Jefferson A/C.1 H. Jelley; A/C.2 J. A. Jenner; Act. Wing Cdr. G. B. Jepson; L.A/C. E. A. Johnson; A/C.1 R. W. Johnson; Cpl. B. P. Jones; A/C.1 D L. Jones; A/C.2 L. W. Jones; L.A/C. M P. Jones; A/C.2 A. Keene; Cpl. K. Kennerley; L.A/C. R. C. Kimpton; Flt. Sgt. L. A. King; L.A/C. T. Kitchingham; L.A/C E. L. Kleiser; Sgt J. E. Le Cheminant; A/C.2 H. J. Legg; A/C.2 G. Lewis; L.A/C. J. Longbottom; A/C.1 E. A. Longstaff; A/C.1 C. R. G. Lucas; Cpl. L. McKeon; L.A/C. G A. McLaren; A/C.2 K. G. Marden; Cpl. F. R. W. Marshall; L.A/C. E. C. Merrick; A/C.1 G. R. Miller; Cpl. H. E. Milton; L.A/C. P. H. E. Monks; A/C.1 E. Moore; L.A/C. H. D. Moore; L.A/C. D. G. Moppett; L.A/C. C. K. Morgan; W/O. D. L. Morgan; L.A/C. J. K. Mort; L.A/C. W. J. Moss; A/C.2 A. C. Moxon; Cpl. T. P. Muckle; A/C.1 J. Mullaney; Cpl. G. E. Mundy; A/C.1 J. Murphy; A/C.1 T. Neale; Sgt. S. A. Orchard; A/C.2 R. C. Parker; L.A/C. W. A. Parkes; L.A/C. F. W. Parsons; L.A/C. W. E. Payne; A/C.1 W. H. B. Payne; Flt. Lt. G. H. Pemberton; A/C.2 F. E. Penny; L.A/C. F. Pepper; L.A/C. W. Pittendreigh; A/C.2 L. G. Potts; A/C.2 G. R. Price; Cpl. L. A. S. Pridgeon; A/C.1 D. Priestley; Act. Cpl. D. J. B. Quigg; A/C.1 A. Ramsden; A/C.1 D. D. Ray; L.A/C. A. G. Reynolds; Cpl. A. Roberts; Cpl. J. F. Roche; A/C.1 J. N. Rosine; A/C.2 J. F. Rouchy; L.A/C. W. E. Scott; L.A/C. F. C. Sherriff; A/C.1 K. B. Slater; A/C.1 L. R. Smart; Cpl. A. V. Smith; L.A/C. J. T. Smith; L.A/C. J. H. Smith; L.A/C. A. R. Spivey; A/C.2 S. F. Stockman; L.A/C. N Stockton; A/C.2 H. G. Taylor; Cpl. W. P Terry; L.A/C. E. J. Thomas; A/C.2 H. Thompson; L.A/C. R. Thompson; A/C.1 R. W. Thornton; L.A/C. G. E. Todd; L.A/C G. D. Train; A/C.2 G. R. Twine; L.A/C. P. T. Valentine; Cpl. M. W. Walmsley; Sqn. Ldr. J. T. Wanless; Cpl. C. W. Ward; A/C.1 L. R. Warren; L A/C. R. Watts; Cpl. K. J. Waud; L.A/C. J. E. Webb; Cpl. W. Webster; A/C.2 J. Weinstock; L.A/C. T. Welding; W/O. C. A. Weston; A/C.1 C. C Weston; A/C.1 W. A. Wilkinson; A/C.2 J. Williams; L.A/C C. Willis; A/C.1 R. W. Willson; Sgt. R. J. Wilson; A/C.1 L. G. Winch; L.A/C. C. G. Winder; Cpl. J. G. Winter; L.A/C. T. Wiper; L.A/C. O. S. Wright.

Women's Auxiliary Air Force

DIED ON ACTIVE SERVICE.—A/CW.1 D. M. Hatchett; A/CW.1 N. Hodgson.

Royal Australian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—Flt. Sgt. L. A. Bayley; W/O. J. J. Boyle; Flt. Sgt. W. H. J. Butcher; Flt. Sgt. C. J. Kenny; Flt. Sgt. F. C. Langdon; Act. F/O. A. T. Ley; F/O. K. R. Nerney; Flt. Sgt. D. J. Paterson; F/O. J. C. Paton; Act. F/O. M. L. Perez; W/O. E. A. Petersen; W/O. W. Plumb; Flt. Lt. D. H Rutter; W/O. J. R. Williams; F/O. B. S. Woolstencroft.

DIED ON ACTIVE SERVICE.—W/O. J. P. Foady; L.A/C. A. J. O'Brien.

Royal Canadian Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—P/O. J. E. Bohemier; F/O. T. D. Copeland; F/O B. E. Drewery; Flt. Sgt. G. B. Hamilton; F/O. J. Hornoi; F/O. C. J. Jones; F/O T. S. Lawrence; P/O. J. McGee; P/O. J. T. Rose; Flt. Sgt. A. N. Scorah; P/O. W. W. Webber.

DIED ON ACTIVE SERVICE.—Sgt. W. H. James.

South African Air Force

PREVIOUSLY REPORTED MISSING, NOW PRESUMED KILLED IN ACTION.—2/Lt. E. Nowars; W/O. L. A. Preston; W/O. J. V. Robertson; W/O. B. Taylor.

PREVIOUSLY REPORTED MISSING, BELIEVED KILLED ON ACTIVE SERVICE, NOW PRESUMED KILLED ON ACTIVE SERVICE.—Cpl. R Hosmer; 2/Lt. M. Roux.